APPENDIX 3-3

PUEBLO CHEMICAL AGENT-DESTRUCTION PILOT PLANT EXPLOSIVE DESTRUCTION SYSTEM AT PUEBLO CHEMICAL DEPOT SITE-SPECIFIC MONITORING PLAN

U.S. Army
Chemical Materials Activity

Recovered Chemical Materiel Directorate

Pueblo Chemical Agent-Destruction Pilot Plant Explosive Destruction System at Pueblo Chemical Depot

Site-Specific Monitoring Plan

Final

U.S. Army
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Site-Specific Monitoring Plan

Final

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1. INTRODUCTION

This document presents a Site-Specific Monitoring Plan (SSMP) for Pueblo Chemical Agent-Destruction Pilot Plant (PCAPP) Explosive Destruction System (EDS) operations conducted at Pueblo Chemical Depot (PCD), Pueblo, Colorado. This plan details monitoring requirements for mustard agent and addresses the monitoring requirements specified in the following documents:

- U.S. Army Chemical Materials Agency, *Programmatic Monitoring Concept Plan* (MCP)

- U.S. Army Chemical Materials Agency, *Programmatic Laboratory and Monitoring Quality Assurance Plan* (LMQAP) and the Edgewood Chemical and Biological Center Environmental Monitoring Laboratory *Laboratory and Monitory Quality Control Plan for Chemical Materials Agency (CMA) and for Chemical Agent Standard Analytical Reference Material (CASARM)*, here after referred to as the ECBC QCP.

Chemical operations will typically be conducted in Level C personal protective equipment (PPE). However, all monitoring will be performed at levels required for unmasked workers, designated as "no respiratory protection" in the airborne exposure limit (AEL) tables.

A typical operational day will be from 10 to 12 hours long. During operations, continuous near real-time (NRT) monitoring and historical monitoring will be performed. MINICAMS® units will not be challenged during non-operational hours (that is, nights and weekends). At no time will mustard agent-filled munitions be stored onsite in the Environmental Enclosures during non-operation hours.

1.1 Purpose and Scope

The purpose of this monitoring plan is to define the strategy used to monitor airborne exposure concentrations of mustard agents during EDS operations at the PCAPP EDS site.

This plan outlines monitoring objectives, procedures, and responsibilities for the execution of a monitoring program during operations. It includes worker protection and process monitoring during the following:

- Monitoring of the Modified Ammunition Vehicle (MAV) prior to removal and during removal of mustard agent-filled munitions from the vehicle at Container Storage Unit (CSU) H1102 or, in the event of just-in-time delivery, at the EE

- First entry monitoring and operations at CSU H1102

- EDS operations.

Monitoring strategies used to support PCAPP EDS site operations are based on the following:

- Only mustard agent-filled munitions, Department of Transportation (DOT) cylinders, and other miscellaneous items that are part of the PCD stockpile will be treated/destroyed.

- The EDS unit will be located inside an Environmental Enclosure equipped with two Air Filtration Systems (AFSs).

- Monitoring for the specific chemicals of concern will be performed continuously during operations in the Environmental Enclosure and will remain in place until closure.

- Mustard agent-filled munitions or chemical agent will not be stored overnight in the Environmental Enclosure.

1.2 Monitoring Objectives

Chemical monitoring during PCAPP EDS site operations is performed to ensure operations are being safely conducted and to detect conditions that may lead to cause a release of chemical agent to the environment. Monitoring of the site during treatment activities will accomplish the following:

- Provide worker protection.

- Protect the environment from a potential chemical release.

- Provide early warning to decision-makers for implementation of corrective action(s).

1.3 Chemicals of Concern

During EDS operations at PCAPP, the chemical agents distilled sulfur mustard (HD) and mustard-T mixture (HT) will be treated. Monitoring of these chemical agents will be achieved by monitoring for bis(2-chloroethyl)sulfide, the H component of the agents.

2. ORGANIZATION AND MANAGEMENT RESPONSIBILITIES

PCAPP EDS site monitoring operations will require collaborative efforts between several government agencies. These agencies and their respective duties are discussed in the following paragraphs.

2.1 Recovered Chemical Materiel Directorate (RCMD)

RCMD is responsible for the following:

- Developing and coordinating the SSMP and procedures required for EDS site operations at PCAPP

- Ensuring appropriate review and approval of monitoring procedures are obtained from the Department of the Army (DA) and outside agencies

- Implementing a quality assurance (QA) program

- Ensuring Occupational Safety and Health Administration (OSHA) and DA health and safety requirements are met.

2.2 U.S. Army Chemical Materials Activity (CMA) Risk Management Directorate (RMD)

The CMA RMD is responsible for:

- Notifying outside agencies such as the CMA Monitoring Office and the Department of Health and Human Services (DHHS) of monitoring results
- Defining laboratory and monitoring QA requirements for monitoring activities
- Advising the RCMD on laboratory-related quality assurance/quality control (QA/QC) practices
- Recommending QA/QC practices for RCMD to use in supporting the EDS monitoring activities
- Reviewing and evaluating this SSMP and quality control (QC) plans
- Monitoring the effective implementation of this SSMP at the PCAPP EDS site
- Reviewing QC data and recommending remediation, as required.

2.3 RCMD Site Manager

RCMD Site Manager is responsible for the following:

- Integrating monitoring operations into overall site operations
- Implementing corrective actions indicated by monitoring results.

2.4 Edgewood Chemical Biological Center (ECBC)

Monitoring will be conducted by ECBC, who will:

- Perform first entry monitoring and monitoring during operations inside CSU H1102
- Perform first entry monitoring and monitoring during operations in the MAV prior to removal and during removal of mustard agent-filled munitions/DOT containers from the vehicle at CSU H1102 or, in the event of just-in-time delivery, at the EE
- Collect and retain all monitoring data and monitoring QC data generated during the project
- Provide guidance for monitoring operations conducted onsite
- Provide trained and certified personnel to operate monitoring equipment
- Provide calibration and challenge research development, test, and evaluation (RDT&E) standards for HD
- Perform monitoring procedures outlined in this Plan
- Provide a Mobile Analytical Platform (MAP) configured with instrumentation capable of analyzing Depot Area Air Monitoring System (DAAMS) tubes.

2.5 PCD

PCD will provide monitoring assistance for all Chemical Accident/Incident Response and Assistance (CAIRA) events during operations at CSU H1102 or the MAV. During these confirmed leaker events, operations will revert to applicable PCD procedures.

3. TYPES OF MONITORING

Placement of each monitoring location is based on potential chemical migration points and verified via the use of a smoke test. When monitoring supports personnel protection, monitoring locations should be located in close proximity of personnel and preferably at the breathing zone height. Heat-traced sample lines (HTSLs) will be no more than 150 feet in length.

The following paragraphs describe the types of monitoring that will be employed during EDS operations. Specific monitoring strategies for analytes are provided in Section 4.

3.1 NRT Monitoring

NRT monitoring is performed in areas where contamination is likely or possible in order to determine airborne chemical concentration of chemical warfare agents in the shortest amount of time at the monitoring level commensurate with engineering controls and worker protection. The NRT monitoring system must have the capability to automatically collect, analyze, and report/display the results within 15 minutes.

3.2 Historical Monitoring

Historical monitoring during operations is performed to measure very low concentrations of airborne analytes at the worker population limit (WPL) and is designed to trigger activities to investigate the source of contamination that may be found below the alarm level of the NRT system. Sampling is accomplished by collecting a DAAMS sample over an extended period of time (usually the duration of a workday); subsequent analysis is conducted at the onsite MAP. All historical DAAMS samples must be analyzed within 72 hours of sampling termination.

When agent exposure is confirmed to exceed the WPL, the *Pueblo Chemical Agent-Destruction Pilot Plant Explosive Destruction System at Pueblo Chemical Depot, Chemical Agent Worker Population Limit Exceedance Plan* is initiated. The PCAPP EDS WPL Exceedance Plan is provided in **Attachment 3**, Waste Analysis Plan, **Appendix 3-4** of the PCD Hazardous Waste Permit.

3.3 Confirmation Monitoring

Confirmation monitoring is performed to validate or invalidate an alarm or positive measurement received from the principal monitoring method (either an NRT method or historical method) and is

accomplished by collecting a vapor sample in the immediate vicinity of the NRT monitor or historical sampling location. Subsequent analysis is conducted offline at the onsite MAP. Confirmation monitoring is used for informational and qualitative data reporting purposes in the event of a chemical materiel release. The confirmation sample shall be analyzed by a method different from the principal method (NRT or historical)[1] to increase the likelihood of detecting interferences and only upon a principal method (NRT or historical) positive response.

The need for analysis of confirmation DAAMS samples may dependent on the actual concentration of agent detected, the operation being performed, the PPE being worn at the time of the NRT alarm, etc. However, analysis of DAAMS tubes is given priority over all other samples.

During chemical agent operations, confirmation DAAMS tubes are continually aspirated throughout the workday. In the event of an NRT alarm, the DAAMS tubes co-located with the alarming MINICAMS are collected and analyzed. DAAMS tubes will be co-located at all NRT monitoring locations with the exception of the exit airlock. This location is for monitoring potentially contaminated personnel and does not require confirmation monitoring.

4. MONITORING EQUIPMENT

Mustard agent will be monitored using the following equipment:

- MINICAMS
- DAAMS tubes.

Table Appendix 3-3-1 provides the type of instrument/equipment used for each monitoring application during PCAPP EDS operations. The following paragraphs describe the instrumentation/equipment in more detail.

Mercury will be monitored using a personal sampling pump located on the platform of the EDS. The personal sampling pump will obtain a grab sample that can be analyzed for the presence or absence of

[1] Analyses performed using a gas chromatograph/mass spectrometer (GC/MS) will not require confirmation analysis.

mercury. In addition to this monitoring, direct read instruments, such as a mercury spectrometer (Lumex) or equivalent direct read instrument, can be used to obtain NRT measurements of mercury.

4.1 MINICAMS

All NRT chemical agent monitoring will be performed using MINICAMS. The MINICAMS is an automated gas chromatograph (GC) that operates by alternating between sampling and analysis cycles.

Table Appendix 3-3-1. Mustard Monitoring Application and Monitor Type

Monitoring Type Chemical of Concern		
NRT Monitoring[a]		
HD; HT	MINICAMS®	MINICAMS configured with an XSD
Historical Monitoring[a]		
HD; HT	DAAMS; GC[b]	Quantitative analysis
Confirmation of NRT Alarm[a]		
HD; HT	DAAMS; GC[b]	Qualitative confirmation of MINICAMS alarm
Confirmation of Historical Monitoring[a,c]		
HD; HT	DAAMS; GC[b]	Qualitative or quantitative confirmation of DAAMS

Notes:

[a] Both HD and HT will be monitored as H.
[b] GCs will be equipped with either a mass spectrometer or flame photometric detector.
[c] If historical DAAMS tubes are analyzed on a gas chromatograph/mass spectrometer (GC/MS), confirmation via an alternative method is not required.

DAAMS = Depot Area Air Monitoring System
GC = gas chromatograph
HD = distilled sulfur mustard
HT = mustard-T mixture
NRT = near real-time
XSD = halogen selective detector

During the sample cycle, a vacuum system pulls an air sample into the MINICAMS via an HTSL. For NRT monitoring, the sampling and analysis cycle of the MINICAMS must be no more than 15 minutes.

The sample enters the MINICAMS and concentrates on a solid sorbent tube (i.e., preconcentrator tube). The sorbent tube is maintained at a temperature that will prevent condensation from forming on the sorbent tube. During sample analysis, the solid sorbent tube is heated to thermally desorb the analytes, while nitrogen flows into the sorbent tube to sweep the analytes into the capillary column for analytical separation. The analytes are separated and carried to the detector for sample analysis.

All MINICAMS units will be located in a monitoring shed and will be equipped with an HTSL that will not exceed 150 feet in length. The distal end of each sample line will be positioned at an NRT sampling location.

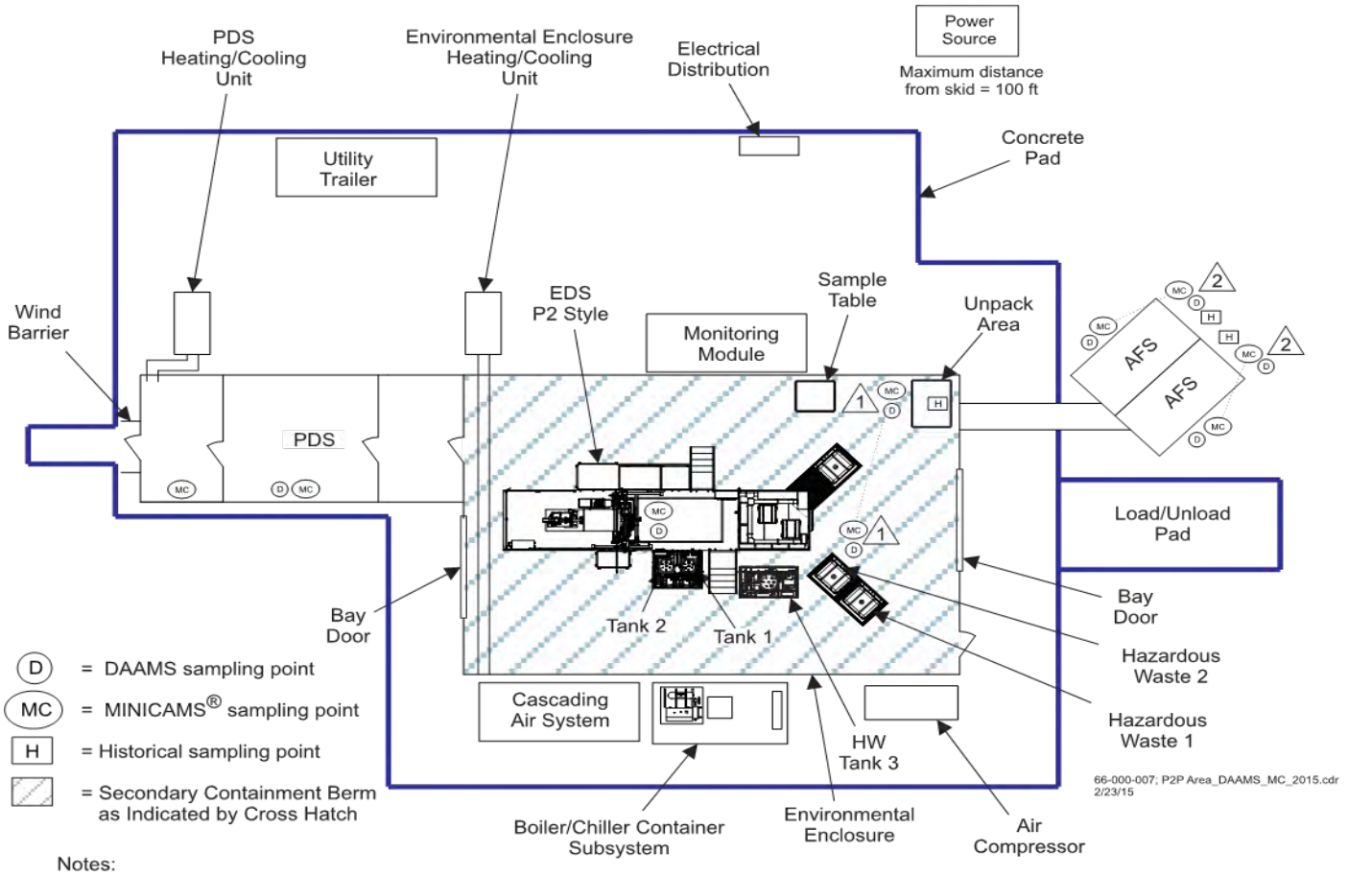
The MINICAMS alarm setpoints/action levels will be 0.25Z or 0.7Z, where Z represents the monitoring level (AEL). **Table Appendix 3-3-2** outlines which alarm setpoint/action levels are implemented for each functional activities.

4.2 DAAMS

DAAMS tubes are used to provide historical agent monitoring at the WPL and to confirm or refute MINICAMS alarms and historical responses. The DAAMS stations are comprised of solid sorbent DAAMS tubes, pumps, and flow control devices. Monitoring with DAAMS employs air aspiration through the DAAMS tube for a predetermined period of time at a controlled airflow rate. Contaminants (ie., mustard agent) in the air are adsorbed on the solid sorbent. Aspirated DAAMS samples are then analyzed in the MAP laboratory to determine concentrations of mustard chemical agent. Laboratory analysis uses thermal desorption of the analytes from the sorbent tubes into a GC/MS. Analysis by GC/MS does not require confirmation by an alternate method.

5. MONITORING STRATEGY

The following paragraphs describe the monitoring strategy that will be employed during EDS operations involving HD and HT at the PCAPP EDS site. Both HD and HT will be measured at HD. Monitoring locations during mustard operations are illustrated in **Figure Appendix 3-3-1**. **Table Appendix 3-3-2**



Notes:

1. A single MINICAMS® unit will be used to monitor at the sample unpack area or over the hazard waste container depending on the operation being performed at the time.

2. In the AFS, there will be a single, separate MINICAMS® monitoring each unit. Each MINICAMS will operate in conjunction with an automatic stream selection system that allows collection and analysis of samples at each of the three levels of the midbed. In the event of a confirmed alarm at one of the midbed locations, the stream selection system will be manually switched to monitor the stack location.

Figure Appendix 3-3-1. Monitoring Locations During Mustard Operations

Table Appendix 3-3-2. Summary of Air Monitoring Strategy During PCAPP EDS Operations

Monitoring Location or Functional Activity	NRT Monitoring[a]	NRT Confirmation[b]	NRT Alarm Setpoint/ Action Level	Historical Monitoring[c]	Historical Confirmation[c]	Notes/Comments
CSU Surveillance[d]	VSL	VSL	0.25Z	VSL	VSL	Surveillance monitoring is required weekly at a minimum.
CSU First Entry Monitoring	VSL	VSL	0.25Z			During PCAPP EDS operations, first entry monitoring will be performed prior to opening the door of CSU H1102.
CSU Operations	VSL	VSL	0.25Z	WPL	WPL	Monitoring is required anytime mustard agent-filled munitions are stored and operators are present inside CSU H1102.
CSU Passive Filters-Midbed	VSL	VSL	0.25Z			Required only in the event of confirmed mustard agent detection during surveillance/first entry monitoring.
CSU Passive Filter-Exhaust	VSL	VSL	0.25Z			Required only in the event of a confirmed mustard agent concentration at the passive filter midbed location in the active filter.
1,000 cfm Filter-Midbed	VSL	VSL	0.25Z			Require monitoring upon installation and every 24 hours until there are no more confirmed agent concentrations inside the CSU or MAV.
1,000 cfm Filter-Exhaust	VSL	VSL	0.25Z			Continuous monitoring required only in the event of confirmed agent concentration at the midbed location.

Table Appendix 3-3-2. Summary of Air Monitoring Strategy During PCAPP EDS Operations (Continued)

Monitoring Location or Functional Activity	NRT Monitoring[a]	NRT Confirmation[b]	NRT Alarm Setpoint/ Action Level	Historical Monitoring[c]	Historical Confirmation[c]	Notes/Comments
MAV First Entry Monitoring	VSL	VSL	0.25Z			Monitoring of the interior of the MAV is required prior to opening to off-load mustard agent-filled munitions at CSU H1102 or, in the event of just-in-time deliveries, at the EE. In the event of a confirmed agent concentration, a 1,000 cfm filter will be installed on the MAV, which requires monitoring as described above.
MAV Operations	VSL	VSL	0.25Z	WPL	WPL	Monitoring is required anytime mustard agent-filled munitions are being transferred from the MAV to the CSU or, in the event of just-in-time deliveries, at the EE.
Workspace Process Areas Inside Environmental Enclosure[e]	VSL	VSL	0.7Z	WPL	WPL	Continuous during daily operations.
Environmental Enclosure AFS Midbed[g]	VSL	VSL	0.7Z			Requires continuous monitoring during daily operations.
Environmental Enclosure AFS Exhaust (Stack)	VSL	VSL	0.7Z	VSL	VSL	NRT monitoring required only in the event of confirmed agent concentrations at the midbed location.
Environmental Enclosure AFS Filter Operations	STEL	STEL	0.7Z	WPL[f]	WPL[f]	NRT, confirmation of NRT alarms, and historical monitoring are required when conducting operation in the filters such as changing out carbon filters.
PDS	STEL	STEL	0.7Z			Worker protection monitoring.
Exit Airlock	STEL		0.7Z			Monitoring for potentially exposed personnel only. Confirmation is not required.

Treaty Trailer				WPL	WPL	Historical monitoring is required inside the treaty trailer when OPCW team members are present during EDS operations.

Table Appendix 3-3-2. Summary of Air Monitoring Strategy During PCAPP EDS Operations (Continued)

Notes:

[a] All NRT monitoring will be conducted with MINICAMS® equipped with halogen selective detectors (XSDs).

[b] Confirmation of NRT alarms will be performed by collection and analysis of Depot Area Air Monitoring System (DAAMS) tube samples.

[c] Historical monitoring will be performed by collection and analysis of DAAMS tubes.

[d] First entry monitoring of CSU H1102 satisfies the requirement for CSU H1102 surveillance monitoring also. In the event that a cessation of operations results in first entry monitoring is not performed within 7 days of the last entry, CSU H1102 shall be monitored to satisfy the requirements of surveillance monitoring.

[e] Workspace process area locations inside the Environmental Enclosure include the sample unpack area, the Containment Vessel door, the waste drums. Historical monitoring inside the Environmental Enclosure will be conducted at the inlet of the air filtration systems.

[f] Historical monitoring during filter changeout (bag-in/bag-out procedures) will be performed by collecting DAAMS tubes at two locations in the workspace surrounding the filter unit.

[g] In the AFS, there will be a single, separate MINICAMS® monitoring each unit. Each MINICAMS will operate in conjunction with an automatic stream selection system that allows collection and analysis of samples at each of the three levels of the midbed. In the event of a confirmed alarm at one of the midbed locations, the stream selection system will be manually switched to monitor the exhaust (stack) location.

AFS	=	Air Filtration System
cfm	=	cubic feet per minute
CSU	=	Container Storage Unit
EDS	=	Explosive Destruction System
MAV	=	Modified Ammunition Vehicle
NRT	=	near real-time
OPCW	=	Organization for the Prohibition of Chemical Weapons
PCAPP	=	Pueblo Chemical Agent-Destruction Pilot Plant
PDS	=	Personnel Decontamination Station
STEL	=	short-term exposure limit
VSL	=	vapor screening level
WPL	=	worker population limit

details the monitoring levels to be used during operations and **Table Appendix 3-3-3** outlines the AELs for mustard agents.

Monitoring results will be used to ensure operations are being conducted in a safe manner and to detect any conditions that may cause workers to be exposed to chemical agent vapors during upset conditions.

When conducting chemical agent operations, worker protection and process monitoring will be at the vapor screening level (VSL). In areas where worker protection monitoring is conducted, the VSL measurements will be used to calculate short-term exposure limit (STEL) values whenever there is an NRT alarm. Because the NRT monitors measure and report the concentration at the VSL, the 15-minute STEL value is manually calculated using the concentration reported by the NRT monitor to determine if the STEL has been exceeded. An example of this calculation is contained in **Appendix Attachment 3-3-3**.

The VSL is intended for applications and/or locations that require monitoring for an environmental release, engineering controls (for example, filters), process upset condition, or vapor decontamination classification monitoring. The VSL is a concentration-only value and does not consider the analytical method's sampling duration other than to determine the volume of air sampled to calculate the analyte concentration.

Two different MINICAMS methods will be used onsite during PCAPP-EDS operations. A ten minute method will be used for all MINICAMS monitoring the interior of the EE, in the PDS, and in the AFS. A five minute method will be used when monitoring the interior of the CSU and the MAV.

5.1 NRT and NRT/Confirmation Monitoring Inside the Environmental Enclosure and AFS

During HD and HT operations, NRT monitoring for worker protection will be conducted at the 15-minute STEL (0.003 milligram per cubic meter [mg/m^3]) and process monitoring will be conducted at the VSL (0.003 mg/m^3).

NRT monitoring will be performed at several locations within the Environmental Enclosure as well as the AFS. The following paragraphs detail the sampling locations and placement of NRT monitoring equipment inside the Environmental Enclosure and the AFS.

5.1.1 AFS. NRT monitoring will be performed at the midbed or, if necessary, the exhaust (stack) locations of the AFS. Monitoring will be performed using an HTSL interfaced with a MINICAMS located in the monitoring module.

Table Appendix 3-3-3. AELs for HD and HT

	Averaging Time					
	WPL (12 hours)	WPL (8 hours)	WPL (4 hours)	WPL (2 hours)	STEL[a] (15 minutes)	Variable
No Respiratory Protection	2.7×10^{-4} mg/m^3	4×10^{-4} mg/m^3	8×10^{-4} mg/m^3	1.6×10^{-3} mg/m^3	3×10^{-3} mg/m^3	
Air-Purifying Respirator	Use only in accordance with Army/NIOSH approval and restrictions on use.					
M40-Series Mask[b]	1.0×10^{-3}	1.5×10^{-3}	3.0×10^{-3}	6.0×10^{-3}	3.0×10^{-2}	
Supplied-Air Respirator w/o Escape Bottle	0.27 mg/m^3	0.4 mg/m^3	0.4 mg/m^3	0.4 mg/m^3	0.7 mg/m^3	
Self-Contained Breathing Apparatus or Supplied-Air Respirator with Escape Bottle	2.7 mg/m^3	4 mg/m^3	8 mg/m^3	16 mg/m^3	30 mg/m^3	
Vapor Screening Level						3×10^{-3} mg/m^3

Notes:

[a] Exposures at the STEL shall occur not more than one time per day. The Centers for Disease Control and Prevention (CDC) may publish updated numbers.

[b] Use of the M40-series mask in sulfur mustard operations (in addition to escape purposes) is authorized by DA Pam 385-61.

Airborne exposure limits (AELs) are taken from the U.S. Army Chemical Materials Agency *Programmatic Monitoring Concept Plan* (MCP) and 69 FR 24164-24168 (3 May 2004). All AELs are concentration and time values, not concentration only values. Administrative controls may be used to limit potential exposure to workers. However, because administrative controls cannot be used to limit the duration of potential public exposure, only the WPL protective action level is significantly affected by administrative controls, which limit the duration of potential exposure.

The maximum use concentration is the product of the AEL and the assigned protection factor for the respirator. The assigned protection factors used in this table are taken from 68 FR 34036-34119, 6 June 2003. For sulfur mustards, air-purifying respirators are for escape purposes only.

mg/m^3 = milligram per cubic meter
NIOSH = National Institute for Occupational Safety and Health
STEL = short-term exposure limit
WPL = worker population limit

The MINICAMS monitoring the AFS will operate in conjunction with an automatic stream selection system that allows collection and analysis of samples at each of the three levels of the midbed. In the event of a confirmed alarm at one of the midbed locations, the stream selection system will be manually switched to monitor the exhaust (stack) location.

Confirmation DAAMS will be located inside the midbed and exhaust (stack) of the AFS. DAAMS tube stations that allow collection and analysis of samples at each of the three levels of the midbed and the exhaust (stack) of the AFS will be used to collect confirmation DAAMS tube samples in the event of an NRT alarm.

Note: When personnel are performing bag-in/bag-out operations (filter changeout), historical monitoring is required.

5.1.2 Sample Area/Unpack Area or Waste Containers. By employing a stream selection device, a single MINICAMS will have the capability of monitoring at either the sample area/unpack area or the area above the waste containers. The stream selection device will be manually switched to the appropriate location depending on the operational procedure being performed at that time.

NRT monitoring of the sample area/unpack area will be performed using an HTSL interfaced with a MINICAMS located in the monitoring shed. The HTSL will be coiled and hung over the table in the unpack area such that it is approximately 2 feet above the unpack table.

NRT monitoring of the waste drum area will be performed using an HTSL interfaced with a MINICAMS located in the monitoring shed. The HTSL will be coiled and hung over the waste drums such that it is approximately 2 feet above the drums.

Confirmation DAAMS will be co-located at the distal end of the MINICAMS HTSL located in the vicinity of the sample table/unpack area to collect confirmation DAAMS tubes in the event of an NRT alarm. Confirmation DAAMS will also be co-located at the distal end of the MINICAMS HTSL located over the EDS waste containers to collect confirmation DAAMS tube samples in the event of an NRT alarm.

5.1.3 EDS Containment Vessel. NRT monitoring of the Containment Vessel will be performed using an HTSL interfaced with a MINICAMS located in the monitoring shed. The HTSL will be coiled and

hung over the Containment Vessel such that it is approximately 2 feet above and slightly in front of the Containment Vessel door.

Confirmation DAAMS will be co-located at the distal end of the MINICAMS HTSL located over the EDS Containment Vessel to collect confirmation DAAMS tubes in the event of an NRT alarm.

5.1.4 Personnel Decontamination Station (PDS). NRT monitoring will be performed in the PDS using an HTSL interfaced with a MINICAMS located in the monitoring shed. During PDS operations, this MINICAMS will be available for monitoring of potentially contaminated personnel (see paragraph 5.3).

Confirmation DAAMS will be co-located at the distal end of the MINICAMS HTSL and may be collected and analyzed in the event of a work area alarm in the PDS.

5.2 Historical and Historical/Confirmation Monitoring in the Environmental Enclosure and AFS

From the start of operations through closure, any time work is performed inside the Environmental Enclosure, historical monitoring will be performed. Monitoring at the WPL will be performed by collecting DAAMS tube samples inside the Environmental Enclosure at a location near the inlet of the AFS. Monitoring at the VSL will be performed by collecting DAAMS tube samples at the exhaust (stack) of the AFS. Samples analyzed by GC/MS will not require confirmation; however, duplicate tubes will be collected at each location.

5.3 Monitoring for Potentially Exposed Workers

There will be MINICAMS sample locations in both the PDS and the PDS exit airlock. During agent operations, monitoring of potentially exposed workers in the PDS will be conducted in accordance with the DA Memorandum: *Performance Standard for Monitoring Potentially Exposed Workers* (13 September 2007).

5.4 CSU H1102 Monitoring

CSU H1102 will have two fixed monitoring location points for mustard agent monitoring. Two 1/4-inch outer diameter Teflon® sample lines (not heat-traced), permanently marked front and rear, will run for approximately 6 inches outside of the structure at the headwall through the floor drain to the interior of the structure. The front sample line will remain in close proximity to the interior side of the headwall towards the center of the structure without hindering access to the door. The rear sample line will continue down the length of the floor drain channel to the rear wall, turn, and continue to the location at the mid-point of the rear wall of the structure. Exterior CSU H1102 lines are contained within a M2A1 container and are permanently attached to a metal plate with stainless steel Swagelok® unions. The unions will be capped when not in use.

These lines will be used for both first entry monitoring and for monitoring during CSU H1102 operations. **Figure Appendix 3-3-2** illustrates the monitoring locations to be used for monitoring the interior of CSU H1102. Monitoring at the CSU will be performed with MINICAMS units and dedicated HTSLs and DAAMS sampling equipment. The alarm setpoint/action level for first entry monitoring and CSU operations is 0.25Z.

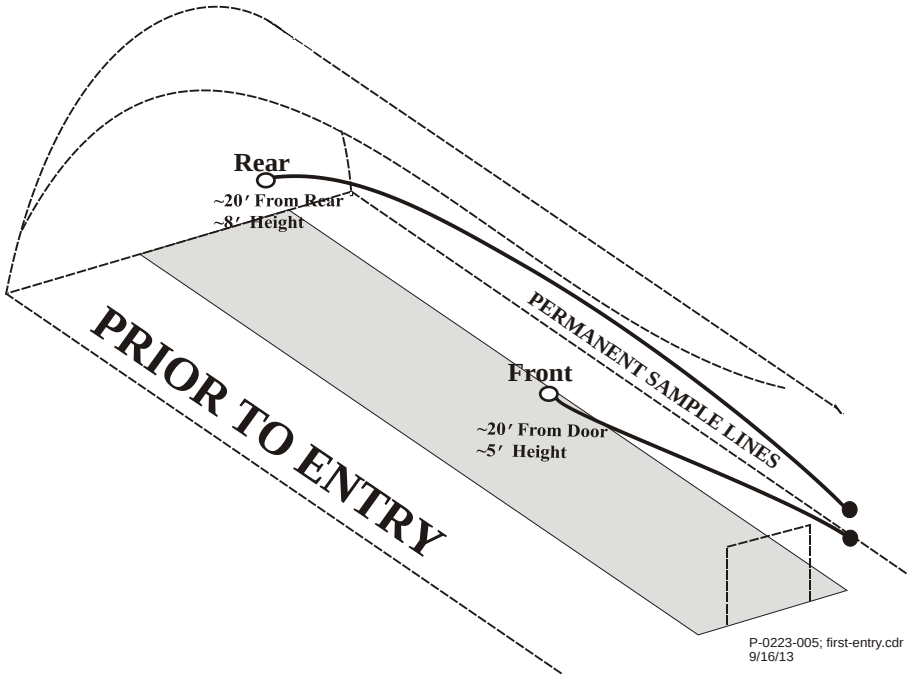


Figure Appendix 3-3-2. CSU H1102 Monitoring Location

Note: The following paragraphs describe the strategies to be used during normal CSU operations. In the event of off normal operations (leaker events), operations will revert to PCD procedures and strategies.

5.4.1 CSU H1102 Surveillance Monitoring. Surveillance monitoring is required on a weekly basis when mustard agent-filled items are stored inside CSU H1102. First entry monitoring of CSU H1102 satisfies the requirement for CSU H1102 surveillance monitoring also. In the event that a cessation of operations results in first entry monitoring not being performed within 7 days of the last entry, CSU H1102 shall be monitored to satisfy the requirements of surveillance monitoring.

5.4.2 CSU H1102 First Entry Monitoring. When mustard agent-filled munitions are being stored in the onsite CSU H1102, first entry monitoring must be performed prior to personnel entry into the unit. First entry monitoring shall be achieved by employing the sampling port on the exterior of the CSU associated with interior line sampling the rear of the CSU.

To clear the CSU for entry, monitoring will consist of three consecutive cycles with concentrations not to exceed the alarm setpoint/action level of 0.25Z.

If chemical agent concentrations are below the alarm setpoint/action level, the CSU H1102 door may be opened and personnel may enter. In the event of a confirmed chemical agent alarm, notifications will be made in accordance with **Table Appendix 3-3-4**, further response will be provided by PCD, and a 1,000 cubic feet per minute (cfm) filter will be installed on CSU H1102.

5.4.3 CSU H1102 Operations Monitoring. Continuous NRT and historical monitoring are required anytime operators are working inside CSU H1102 when mustard agent-filled munitions are in storage. As with first entry monitoring, NRT monitoring during CSU operations will be achieved by employing the sampling port on the exterior of the CSU associated with interior line sampling the rear of the CSU.

Operations may continue in CSU H1102 as long as chemical agent concentrations are below the NRT alarm setpoint/action level (0.25Z). In the event of a confirmed chemical agent alarm, notifications will be made in accordance with **Table Appendix 3-3-4**, further response will be provided by PCD, and a 1,000 cfm filter will be installed on CSU H1102. If there are no confirmed chemical agent alarms, the CSU H1102 door may be opened and personnel may enter.

In addition, historical monitoring at the WPL is required during operations inside the CSU. This will be accomplished by locating DAAMS sampling equipment near the front of the CSU to collect vapor samples. In the event that historical monitoring indicates confirmed concentrations equal to or greater

Table Appendix 3-3-4. NRT Alarm Notification Matrix

Situation	Notification	Possible Action[a]
Single MINICAMS® Alarm	• PCAPP EDS Command Post • PCD OC • SSHO	• Await result of next MINICAMS cycle • Evacuate non-essential personnel • Evaluate PPE level • Analyze DAAMS tubes
Two Consecutive MINICAMS Alarms	• PCAPP EDS Command Post • PCD OC • SSHO	• Await result of next MINICAMS cycle • Evaluate PPE level • Determine source of contamination
Three Consecutive MINICAMS Alarms	• PCAPP EDS Command Post • PCD OC • SSHO	• Determine source of contamination

Notes:

[a] This table is based on detection of chemical warfare materiel (CWM) at the alarm setpoint. Decision on actual actions taken will reside with the RCMD Site Manager. Actions may vary, depending on the actual concentration of CWM detected, the operation being performed, the location of the alarm, etc.

DAAMS = Depot Area Air Monitoring System
EDS = Explosive Destruction System
OC = Operations Center
PCAPP = Pueblo Chemical Agent-Destruction Pilot Plant
PCD = Pueblo Chemical Depot
PPE = personal protective equipment
SSHO = Site Safety and Health Officer

than the WPL but less than the STEL and with no corresponding NRT alarm, the WPL Exceedance Plan will be enacted (**Attachment 3**, **Appendix 3-4**, of the PCD Hazardous Waste Permit).

5.5 MAV Monitoring at CSU H1102

The MAV will have two fixed monitoring location points for mustard agent monitoring, one near the cab of the truck and one near the roll-up door. The monitoring ports consist of stainless steel Swagelok unions on the exterior of the MAV. The unions will be capped when not in use. During normal operations, the location near the cab will be used for NRT monitoring for first entry and for operations inside the MAV. **Figure Appendix 3-3-3** depicts the monitoring and filter ports on the exterior of a MAV.

Note: The following paragraphs describe the strategies to be used during normal CSU operations. In the event of off normal operations (leaker events), operations will revert to PCD procedures and strategies.

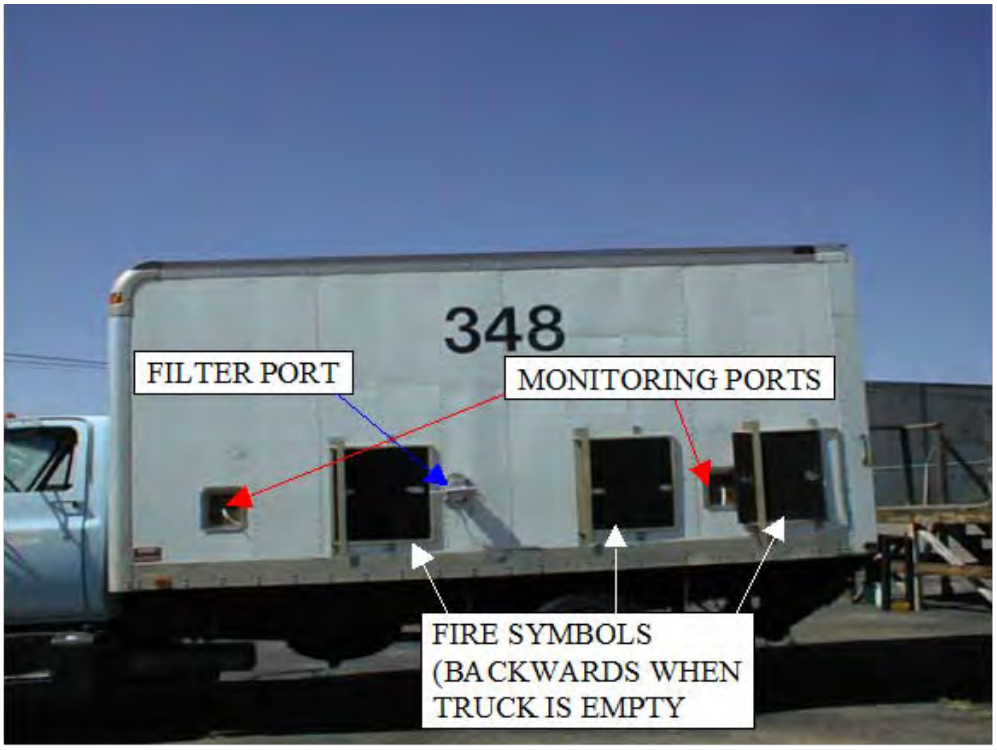


Figure Appendix 3-3-3. MAV Monitoring and Filter Ports

5.5.1 MAV First Entry. Prior to personnel opening the MAV door to remove mustard agent-filled munitions at CSU H1102 or, in the event of just-in-time delivery, at the EE, first entry monitoring must be performed. To clear the MAV for entry, monitoring will consist of two consecutive cycles with concentrations not to exceed the alarm setpoint/action level of 0.25Z. Monitoring will be conducted using the monitoring port nearest the cab of the truck.

In the event of a confirmed agent alarm, notifications will be made in accordance with **Table Appendix 3-3-4**, further response will be provided by PCD, and a 1,000 cfm filter will be installed on the MAV.

5.5.2 MAV Operations. Both NRT and historical monitoring are required when operators are unloading the MAV at CSU H1102 or, in the event of just-in-time deliveries, at the EE. NRT monitoring will be performed using the monitoring port nearest the cab of the MAV and the alarm setpoint/action level will be 0.25Z. Historical monitoring will be performed at the back of the MAV nearest the roll-up door.

5.6 Treaty Trailer

Historical monitoring will be conducted inside the treaty trailer on all operational days that OPCW team members occupy the trailer.

5.7 CSU H1102 Passive Filter Unit Monitoring

The CSU is equipped with a passive filter system. In the event of a confirmed MINICAMS alarm during first entry or operations monitoring of CSU H1102, monitoring of the passive filter units on the exterior of the CSU door and on the CSU exhaust will be required.

If chemical agent concentrations are equal to or greater than the alarm level, notifications will be made in accordance with **Table Appendix 3-3-4** and further response will be provided by PCD.

Monitoring will be performed at the uppermost monitoring point on the rear vent passive filter and the low static pressure port on the front passive filter for three MINICAMS cycles. If confirmed chemical agent concentrations are encountered at either monitoring location, the PCAPP EDS Command Post will

be alerted. Monitoring of the passive filters will be performed by PCD in accordance with PCD Standing Operating Procedure (SOP) **PCD SOP-PU-0000-M-491**.

Figures Appendix 3-3-4 and **Appendix 3-3-5** illustrate the passive filter monitoring locations door and the exhaust, respectively.

5.8 1,000 cfm Unit Monitoring

When a 1,000 cfm filter unit is in use on either CSU H1102 or the MAV, monitoring will be performed by PCD in accordance with PCD SOP 491 at the midbed of the unit upon installation/activation and at least once every 24 hours. If agent is detected at or above the alarm level at the midbed location, then the filter exhaust will be monitored on a continuous basis until a replacement filter can be installed. In the event that chemical agent is detected at the filter exhaust, the filter will be shut down and the vents to the structure will be closed until a serviceable filter unit can be installed and activated.

5.9 Waste Monitoring

Monitoring of wastes is detailed in the PCAPP EDS Sampling and Analysis Plan (**Annex I** of the Destruction Plan).

6. PREVENTIVE MAINTENANCE

Preventive maintenance of all monitoring equipment will be performed in accordance with the approved quality plans and procedures.

7. QC REQUIREMENTS

7.1 Certification Requirements

The MAP laboratory shall perform a certification and validation process for operators, instruments, and methods to confirm that analytical processes are suitable for use. Method certification will require completion of a successful precision and accuracy (P&A) study and initial baseline study. Method certification will be required before the method can be used in support operations. Method validation will be demonstrated through the continuing baseline study.

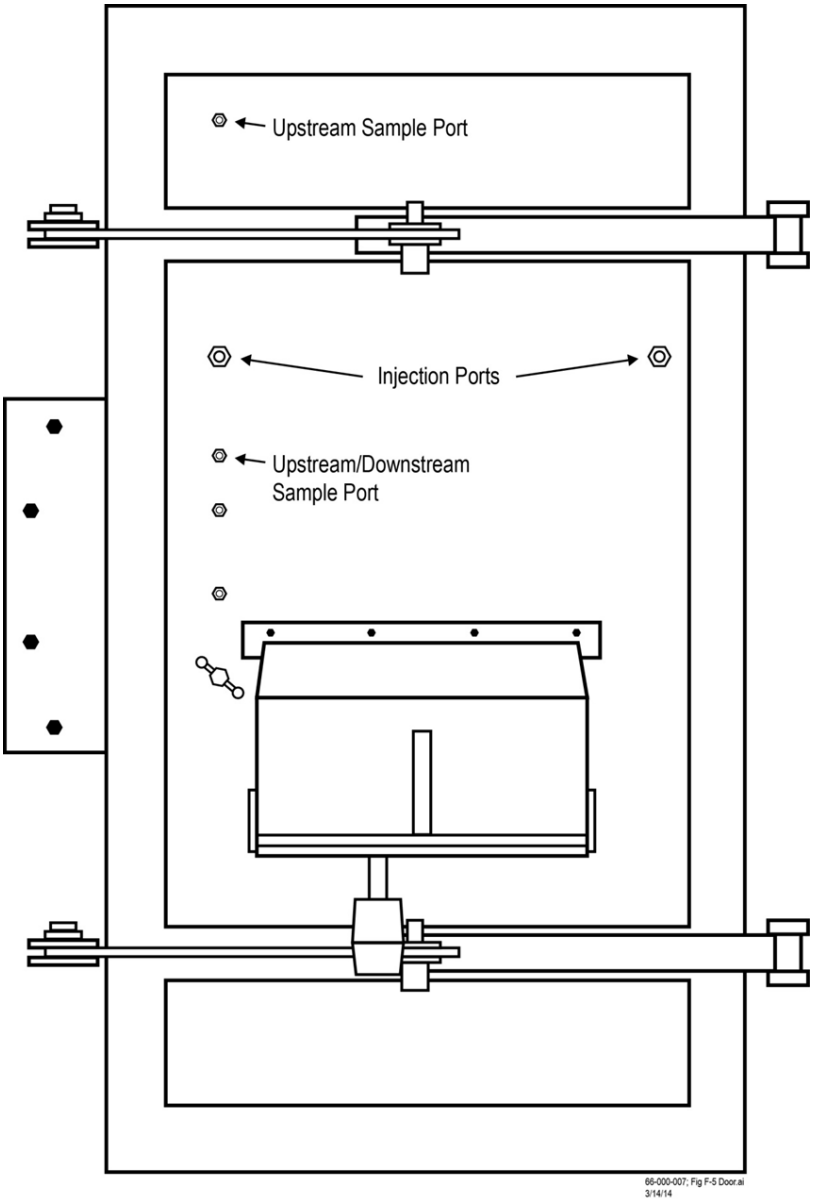


Figure Appendix 3-3-4. Passive Filter Monitoring Locations on Exterior of CSU Door

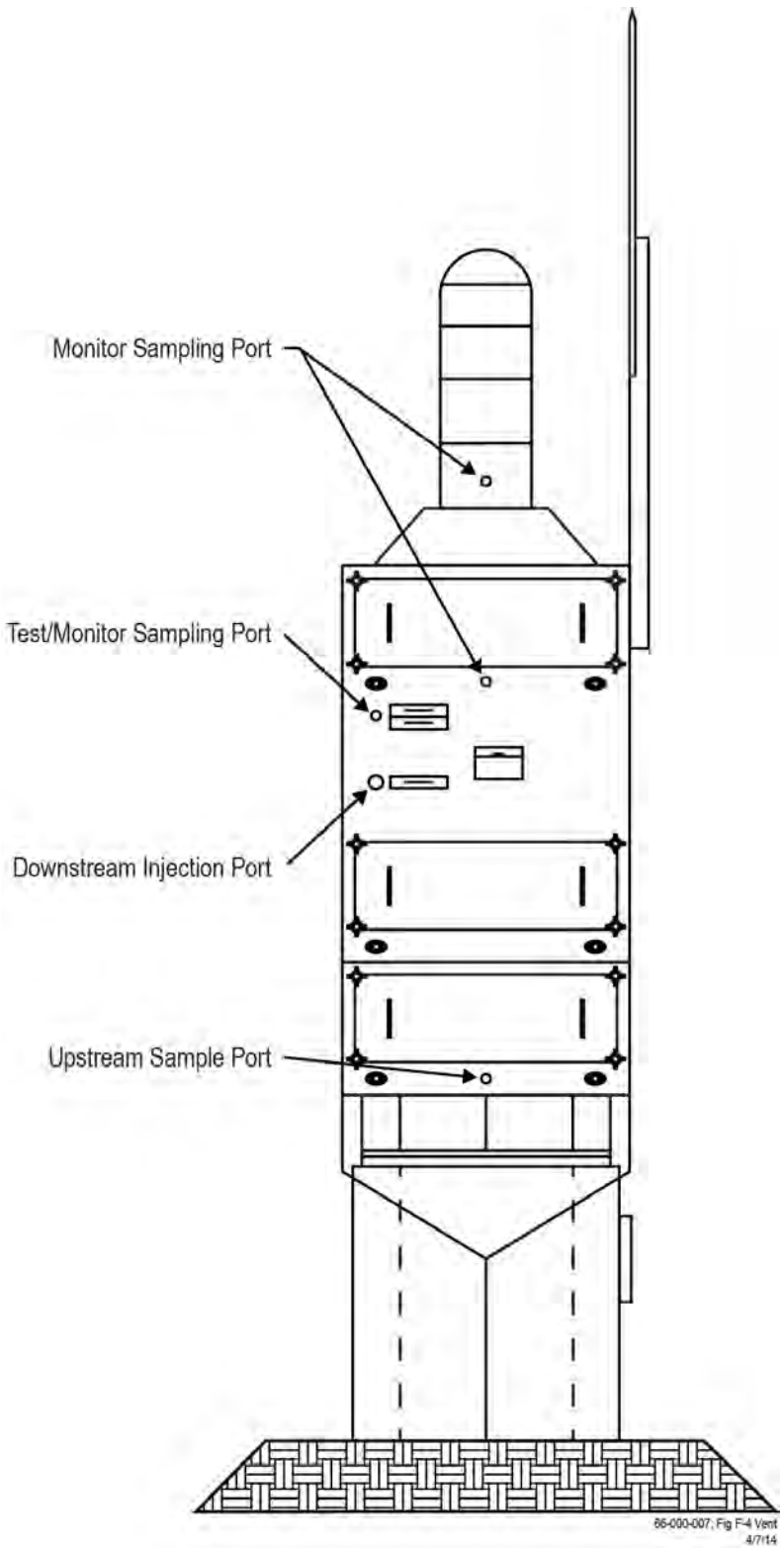


Figure Appendix 3-3-5. Passive Filter Monitoring Locations on CSU Exhaust

7.1.1 P&A Method Certification. P&A studies will be performed at the PCAPP EDS site prior to the pre-operational survey so that data may be evaluated by the CMA Monitoring Office. All P&A studies must be completed in accordance with the U.S. Army Chemical Materials Agency LMQAP (most current version). NRT and historical methods will meet the requirements of Class I methods and the confirmation method shall meet the requirements of a Class III method.

Note: Class I and Class III are defined in the ECBC LMQCP Sections 4.18.1.1.1 (p. 45) and 4.18.1.1.2 (p. 46),

7.1.2 Baseline Method Certification and Validation. All methods shall successfully satisfy the requirements of baseline study in accordance with certification and validation requirements detailed in the U.S. Army Chemical Materials Agency LMQAP.

During the initial baseline studies, all sampling and analysis operations shall be performed exactly as set forth in the applicable analytical procedures under similar operating conditions for instruments shown to be in control. Each NRT station and each historical method is an independent monitoring system and must pass the baseline requirements appropriate for that system on a per-station or per-method basis.

The continuing baseline study will be conducted to validate long-term performance of the monitoring systems. The continuing baseline study begins immediately after successful completion of the initial baseline and continues to the cessation of monitoring.

The request and approval for using an alternate baseline are contained in **Appendix Attachment 3-3-4**.

For monitoring cessation less than 60 days, method re-certification baselines shall be performed in accordance with the U.S. Army Chemical Materials Agency LMQAP. For monitoring cessation greater than 60 days, a new initial baseline is required per the LMQAP in order to reestablish a continuing baseline.

7.2 Calibration Requirements

ECBC shall have an established and documented calibration program. All monitoring and laboratory equipment used to support this mission shall be calibrated in accordance with the requirements detailed in the U.S. Army Chemical Materials Agency LMQAP.

Calibration data shall be formatted to support storage and retrieval. Calibration records shall identify the following:

- Chemical name
- Date and time
- Instrument identification number
- Name or unique identification number of operator
- Calibration standard identification number
- Analyte standard introduction, where applicable.

7.3 Challenge Requirements

All instruments and monitoring methods used for the analysis of chemical agents shall be subject to periodic QC sample analysis for each chemical the instrument will analyze to check the process from sample collection through analysis. All instruments/methods will be challenged in accordance with criteria from the latest version of the U.S. Army Chemical Materials Agency LMQAP.

7.4 Monitoring QC Data Statistical Validation

Statistical validation will be documented in reports, which will include QC data (i.e., calibrations, challenges), statistical analysis, and corrective actions. The MAP will submit the QC data to the CMA mandated statistical program from initial baseline through the completion of closure at https://home.cma.army.mil/qcdrs.

7.5 Equipment Acceptance Requirements

Monitoring equipment must be qualified by meeting or exceeding qualification requirements as specified in the latest version of the U.S. Army Chemical Materials Agency LMQAP.

Acceptance testing will demonstrate the ability of the equipment to properly collect, detect, and quantify the chemical compound of interest. Acceptance test pass/fail criteria and detailed requirements for equipment criteria are specified in the ECBC QCP.

8. LIMITING CONDITIONS OF OPERATION (LCOs)

All RCMD operations are governed by LCOs. The RCMD Site Manager will determine that all monitoring LCOs have been achieved on a daily basis before operations can commence. These LCOs will be included in the site LCOs that will be reported to the PCD Operations Center (OC). **Tables Appendix 3-3-5** and **Appendix 3-3-6** list the recommended laboratory LCOs and recommended monitoring LCOs, respectively.

9. NRT NOTIFICATIONS

In the event of an NRT alarm, the MINICAMS operator will notify the PCAPP EDS Command Post. Further notifications will be the responsibility of the RCMD Site Manager. **Table Appendix 3-3-4** lists several possible scenarios, persons to be notified, and possible actions to be taken.

10. DOCUMENTATION

10.1 General Monitoring Documentation

During operations, monitoring personnel will maintain documentation of all monitoring activities. The documentation will include activity information on daily vapor monitoring, sample records, chain-of-custody (COC) forms or transfer of possession, sample analysis records, equipment calibration, equipment maintenance records, agent response, and SOPs, and/or Internal Operating Procedures (IOPs) for vapor monitoring and laboratory analysis.

Table Appendix 3-3-5. Recommended Laboratory LCOs

Personnel[a]
• Certified GC Operators • Certified Laboratory Technicians and Data Management Personnel • Certified Laboratory Management/Designee Present
Calibration and QA/QC
• Calibration and Challenge Standards Current • Operational[b] Instruments Calibrated and in Control
Laboratory Facility
• Operational Ventilation System (Fume Hoods) • Heating, Ventilation, and Air Conditioning within Operational Limits • Electrical Power Operational • Operational Eye Washes and Safety Showers • Communications Operational[c]
Instrumentation[a]
• Operational Analytical Instruments • Operational Support Equipment[d] • Primary and Confirmation Methods in Control • Temperature Requirements as Specified by Manufacturer

Notes:

[a] A minimum 1 person must be available to perform the laboratory functions during operations.

[b] Operational instruments are those that are necessary to support daily laboratory operations. During mustard agent operations there must be 1 instrument operational available for analysis of confirmation and historical DAAMS tubes and when treating agent in the EDS there must be 1 operational instrument available for analysis of liquid neutralent samples.

[c] Communications shall be telephone and/or radio communications.

[d] Support equipment includes vacuum pumps, pH meter, etc.

GC = gas chromatograph
QA/QC = quality assurance/quality control

Table Appendix 3-3-6. Recommended Monitoring LCOs

Personnel[a]
• Certified NRT Instrument Operators • Certified Laboratory/Monitoring Management/Designee Present
Calibration and QA/QC
• Agent Calibration and Challenge Standards Current • Operational[b] Instruments Calibrated and in Control • Operational[b] Method in Control (Quality Plant samples [QPs])
Instrumentation[a]
• Currently Approved Operational NRT Instruments • All Designated NRT Monitoring Locations Equipment • Operational Support Equipment[c] • Operational Historical and Confirmation Sampling Equipment

Notes:

[a] A minimum of 1 person must be available to perform the functions of onsite monitoring during operations.

[b] Operational instruments/methods are field instruments and sampling equipment required to support daily monitoring operations. During mustard agent operations in the EE, monitoring must be available for each of 6 monitoring locations (redundancy of MINICAMS in the PDS requires that a minimum of one of the PDS locations have monitoring), which can be achieved by 5 operational MINICAMS units using stream selection devices on some instrument. During first entry monitoring at the CSU or MAV off-loading at the EE in the event of just-in-time delivery 1 operational MINICAMS, 1 operational confirmation DAAMS sample station, and 1 historical DAAMs station must be available. During MAV offloading at the CSU 2 operational MINICAMS, 2 confirmation DAAMS sample stations, and 2 historical DAAMS station must be available.

[c] Support equipment includes vacuum pumps, sample probes, sample lines, dilution systems, etc.

NRT = near real-time
QA/QC = quality assurance/quality control

10.2 Alarm Confirmation Reports

In the event of a confirmed chemical agent alarm, the U.S. Army Chemical Materials Agency MCP requires that a confirmed chemical materiel report be compiled. The report shall contain the following information:

- Identification of the chemical materiel
- Sample ID Number\Sample Station
- Found concentration or positive agent identification, in mg/m^3
- Associated NRT reading (if applicable)
- Date, time, and location of reading or measurement
- QC sample results supporting the analytical results
- Statement on the quality of monitoring data and printouts of the actual data
- Any chemical materiel readings at any relevant stations at the site, destruction facility, or storage facility
- Description of site operations during the sample aspiration period
- A statement of the potential chemical compound's source
- Explanation of response or operator comments
- Name/unique ID number of operator collecting and analyzing the sample

- Analytical method used for analysis

- Analytical instrument ID.

10.3 Equipment Documentation

All support MAP laboratory analytical equipment information will be documented by support laboratory personnel. The MAP laboratory will document and maintain all acceptance test results for the equipment. Information regarding each instrument shall be documented in logbooks, an electronic database, or other applicable format.

10.4 Reference Standards

Standards received by the agent custodian or designated alternates will be maintained onsite, accounted for, undamaged, and properly labeled at all times. Steps for standard decontamination/destruction are outlined in **Appendix Attachment 3-3-5**.

11. TRAINING REQUIREMENTS

All EDS monitoring personnel are required to meet the minimum training requirements outlined in the OSHA standard Title 29 Code of Federal Regulations (CFR) 1910.120 covering Hazardous Waste Operations and Emergency Response (HAZWOPER). All monitoring and laboratory personnel must also meet the training and certification criteria detailed in the U.S. Army Chemical Materials Agency LMQAP. Training records shall be onsite for all personnel supporting PCAPP EDS laboratory and monitoring operations.

APPENDIX ATTACHMENT 3-3-1

ACRONYMS/ABBREVIATIONS

APPENDIX ATTACHMENT 3-3-1

ACRONYMS/ABBREVIATIONS

AEL	airborne exposure limit
AFS	Air Filtration System
CAIRA	Chemical Accident/Incident Response and Assistance
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CMA	U.S. Army Chemical Materials Activity
COC	chain of custody
CSU	Container Storage Unit
DA	Department of the Army
DAAMS	Depot Area Air Monitoring System
DHHS	Department of Health and Human Services
DOT	Department of Transportation
ECBC	Edgewood Chemical Biological Center
EDS	Explosive Destruction System
GC	gas chromatograph
GC/FPD	gas chromatograph/flame photometric detector
GC/MS	gas chromatograph/mass spectrometer
H	Levinstein mustard
HAZWOPER	Hazardous Waste Operations and Emergency Response
HD	distilled sulfur mustard
HT	mustard-T mixture
HTSL	heat-traced sample line
IOP	Internal Operating Procedure

LCO	limiting condition of operation
LMQAP	Laboratory and Monitoring Quality Assurance Plan
MAP	Mobile Analytical Platform
MAV	Modified Ammunition Vehicle
MCP	Monitoring Concept Plan
mg/m^3	milligram per cubic meter
NRT	near real-time
OSHA	Occupational Safety and Health Administration
P&A	precision and accuracy
PCAPP	Pueblo Chemical Agent-Destruction Pilot Plant
PCD	Pueblo Chemical Depot
PDS	Personnel Decontamination Station
PPE	personal protective equipment
QA	quality assurance
QA/QC	quality assurance/quality control
QC	quality control
RCMD	Recovered Chemical Materiel Directorate
RDT&E	research development, test, and evaluation
RMD	Risk Management Directorate
SOP	Standing Operating Procedure
SSMP	Site-Specific Monitoring Plan
STEL	short-term exposure limit
VSL	vapor screening level
WPL	worker population limit

APPENDIX ATTACHMENT 3-3-2

REFERENCES

APPENDIX ATTACHMENT 3-3-2

REFERENCES

Department of the Army, Memorandum, Subject: *Performance Standard for Monitoring Potentially Exposed Workers*, 13 September 2007.

Department of the Army Pamphlet 385-61, *Toxic Chemical Agent Safety Standards*, 13 November 2012.

Edgewood Chemical Biological Center, Environmental Monitoring Laboratory, *Laboratory and Monitoring Quality Control Plan for Chemical Materials Agency (CMA) and for Chemical Agent Standard Analytical Reference Material (CASARM)*, most recent version.

U.S. Army Chemical Materials Agency, *Programmatic Laboratory and Monitoring Quality Assurance Plan*, most recent version.

U.S. Army Chemical Materials Agency, *Programmatic Monitoring Concept Plan*, most recent version.

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APPENDIX ATTACHMENT 3-3-3
CALCULATING SHORT-TERM EXPOSURE LIMIT (STEL) EXPOSURE FROM VAPOR SCREENING LEVEL (VSL) MONITORING DATA

APPENDIX ATTACHMENT 3-3-3
CALCULATING SHORT-TERM EXPOSURE LIMIT (STEL) EXPOSURE FROM VAPOR SCREENING LEVEL (VSL) MONITORING DATA

Determining a worker's STEL exposure level requires a calculation that takes into account the duration of the sample cycle and analytical cycle of the MINICAMS®. The method used for monitoring distilled sulfur mustard (HD) is a 6-minute method, which includes a 3-minute sampling cycle. Because the monitoring method is less than 15 minutes long, it is necessary to calculate the STEL exposure based on multiple monitoring results.

This appendix details calculations for converting VSL MINICAMS readings to the 15-minute STEL for both alarm events as well as leaker operations. Each of the calculations will be readily available in the Pueblo Chemical Agent-Destruction Pilot Plant (PCAPP) Explosive Destruction System (EDS) Command Post in Excel spreadsheet format.

Alarm Events for Unmasked Workers

In the event of an alarm when unmasked workers are present, the amount of time for donning masks must be taken into account. For this purpose, it is assumed that workers require 30 seconds to respond to the alarm and don their protective masks and exit the room. Therefore, worker exposure ends 30 seconds after the MINICAMS alarm sounds.

The STEL exposure is a 15-minute time-weighted average (TWA). The exposure ends when the workers have donned their protective masks; therefore, the calculation will cover the 15 minutes prior to donning the protective mask. If the MINICAMS method being used is a 6-minute method, the 15-minute interval will cover all or parts of four MINICAMS cycles.

Table Appendix Attachment 3-3-3-1 illustrates an example of how the calculation is performed and calculates the STEL exposure at the time of the MINICAMS alarm.

Table Appendix Attachment 3-3-3-1. Example Calculation for Unmasked Worker in the Event of a MINICAMS Alarm

The cycle time is recorded starting with the 0.5 minute time it takes to mask immediately after the alarm.

Z readings from alarming MINICAMS unit

For each "sample" cycle, enter the MINICAMS Z readings. For each "analysis" cycle, enter the greater of the current or previous MINICAMS Z readings.

Multiply the value used for TWA calculation (Z) by the challenge concentration of 0.003 mg/m^3.

Agent concentration multiplied by the cycle time

Calculation of STEL, 15-Minute Time Weighted Average (TWA)								
Monitoring Data						TWA Calculation		
Cycle Number	Cycle Time (min)	MINICAMS Action	MINICAMS Reading (Z)	Value used for TWA Calculation (Z)	Agent Concentration (mg/m^3)	PPE Protection Factor	Weighted Average Exposure (mg/m^3)	15-min TWA Exposure for Unprotected Workers (mg/m^3)
1		Sample		0.2	0.0006	1	0	
		Analyze	0.2	0.2	0.0006	1	0	
2		Sample		0.2	0.0006	1	0	
		Analyze	0.2	0.2	0.0006	1	0	
3	0.5	Sample		0.2	0.0006	1	0.0003	
	4	Analyze	0.2	1.04	0.00312	1	0.01248	
4	6	Sample		1.04	0.00312	1	0.01872	
ALARM	4	Analyze	1.04	1.04	0.00312	1	0.01248	
5	0.5	Sample		0.6	0.0018	1	0.0009	
	0	Analyze	0.6	0.6	0.0018	1	0	
	15						0.4398	0.002932

Total cycle time must equal 15 minutes

Sum of weighted exposure for unprotected workers

Weighted average for unprotected workers divided

66-000-043; Example Calc of STEL-1.pptx
11/21/14

APPENDIX ATTACHMENT 3-3-4
ALTERNATE BASELINE REQUEST AND APPROVAL

DEPARTMENT OF THE ARMY
US ARMY RESEARCH, DEVELOPMENT AND ENGINEERING COMMAND
EDGEWOOD CHEMICAL BIOLOGICAL CENTER
5183 BLACKHAWK ROAD
ABERDEEN PROVING GROUND, MD 21010-5424

RDCB-DPO-MS 30 April 2014

MEMORANDUM FOR RECORD

SUBJECT: Alternate Baseline Request for Explosive Destruction System (EDS) Operations at the US Army Pueblo Chemical Depot

1. The Edgewood Chemical Biological Center Environmental Monitoring Laboratory (ECBC EML) requests approval to use alternate baseline studies during EDS operations at the US Army Pueblo Chemical Depot.

Use of a Three Day Alternate Initial Baseline Study
For projects that are scheduled to be completed in 6 or more operational days, ECBC will conduct a three-day alternate initial baseline study. The initial baseline study will be performed for three days and consist of QP samples analyzed by each analytical method used on site (NRT, NRT confirmation, historical).

QP Sample Acceptance Criteria
QP samples for NRT methods will yield a found concentration within ±25% of the target concentration. QP samples for class I DAAMS methods analyzed with a GC/MSD will yield a found concentration within ±40% of the target concentration. NRT confirmation QP samples will be post-spiked and shall yield a positive response.

Challenge Frequencies for Alternate Initial Baseline Studies
For all NRT methods (class I) each station will undergo daily calibration followed by a minimum of 4 challenges conducted 2 to 3 hours apart. The initial challenge performed as part of daily calibration will be used as one of the four challenges.

For class I historical DAAMS methods one QP per method will be analyzed.

For class II DAAMS perimeter methods one QP per method will be analyzed.

For class III DAAMS NRT confirmation methods one QP per method will be analyzed.

Performance Standards for Alternate Initial Baseline Studies
For class I NRT method, the pooled data from each station will yield an either challenge pass rate (PRE) = 100% and a first challenge pass rate (PR1) of ≥75%; or the statistical response rate at the alarm level (SRR_{AL}) shall be ≥95%.

Printed on Recycled Paper

For class I historical methods (DAAMS) the data shall be pooled by method and the pass rate shall be ≥95%. The pass rate shall be calculated based on section 15 of the CMA LMQAP.

For class II historical perimeter methods (DAAMS) the data shall be pooled by method and the pass rate shall be ≥95%. The pass rate shall be calculated based on section 15 of the CMA LMQAP.

For class III NRT confirmation methods (DAAMS) the data shall be pooled by method and the pass rate shall be ≥95%. A confirmed detection will be considered a passing QP for all NRT confirmation QPs.

Baseline Recertification/Interruptions in Monitoring
Baseline recertification will apply if more than 30 calendar days occur between the initial baseline study and the start of regular operations (continuing baseline study). A single day of regular monitoring operations (continuing baseline) with a minimum of three challenges spaced 4 to 5 hours apart will reset the 60 day clock. If no monitoring operations are conducted for a period of longer than 60 calendar days, ECBC will conduct a new alternate initial baseline study.

2. This memorandum will accompany the site specific monitoring plan for the subject project.

/s/
Michael Knudsen
Field Operations Team
Environmental Monitoring Laboratory

DEPARTMENT OF THE ARMY
US ARMY CHEMICAL MATERIALS ACTIVITY
E4585 HOADLEY ROAD
ABERDEEN PROVING GROUND, MD 21010-5424

REPLY TO
ATTENTION OF

AMSCM-MOR

3 June 2014

MEMORANDUM FOR Edgewood Chemical Biological Center (ECBC) Field Operations Team Environmental Monitoring Laboratory (EML), Air Monitoring Manager Michael Knudsen

SUBJECT: Response to MEMORANDUM FOR RECORD, SUBJECT: Alternate Baseline Request for Explosive Destruction System (EDS) Operations at The US Army Pueblo Chemical Depot (PCD), dated 01 May 2014.

1. References:

a. Emailed: MEMORANDUM FOR RECORD SUBJECT: Same as above.
b. US Army Chemical Materials Activity (CMA) Programmatic Laboratory and Monitoring Quality Assurance Plan (LMQAP) Finial, Change 1 October 2008

2. The Chemical Materials Activity (CMA) Risk Management office has reviewed the alternate baseline request referenced in 1a. The Risk Management office concurs that a Three-Day Alternate Baselines may be used at PCD EDS as stated in reference1a pending ECBC will follow the requirements described in LMQAP, reference 1.b:

a. All air monitoring methods shall successfully satisfy P&A study requirements for method certification, reference 1.b paragraph 13.3 and approved by CMA before performing the baselines.

b. The alternate initial base lines and alternate continuing base lines will be used according to reference 1.b paragraph 13.4.2 and paragraph 13.5.2.

c. Cessation of monitoring for more than 60 days requires repeating the initial baseline study and reestablishing the continuing study.

3. This concurrence does not alleviate ECBC from following Federal, State and local requirements.

4. Please refer comments and/or questions on this action to Sokhom Phann at (410) 436-2592 or email; sokhom.phann.civ@mail.mil.

DREW A. LYLE
Director, Risk Management

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APPENDIX ATTACHMENT 3-3-5

DECONTAMINATION/DESTRUCTION OF RDTE SOLUTIONS

APPENDIX ATTACHMENT 3-3-5
DECONTAMINATION/DESTRUCTION OF RDTE SOLUTIONS

The following steps are followed to decontaminate/destroy RDTE solutions:

1. Vials containing RDTE solutions are opened and the contents are poured into a waste container located inside the fume hood

2. Vials are disposed of in the same waste container located inside the fume hood.

3. The contents of the container are covered in bleach solution and allowed to sit for approximately 24 hours.

4. Prior to disposal, liquid waste will analyzed via ECBC IOP MT-60. The results must be less than 50 ppm for mustard agent.

5. The solids and liquids are separated. The solids appropriately containerized, labeled, and included into the solid waste stream. The liquids are appropriately containerized, labeled, and included in the liquid waste stream.

6. The destruction of RDTE solutions is recorded on ECBC Monitoring Branch Form-14 (MBFORM-14) included on the next page.

MBFORM-14
June 2006
Revision No: 3

RECORD OF DESTRUCTION

The following items have or will be deconned according to all Standing Operating Procedures. The resultant waste, following delisting procedures, is no longer required material.

Item #	Vial #	CSM Type/Lot Number	Date Of DECON	Amount (mL)	Initials of Decon Personnel

CUSTODIAN _____ **USER:** _____

WITNESS: _____

PCD Regulation 50-3

Chemical Operations Directorate:

Pueblo Chemical Depot (PCD) Site-Specific Monitoring Plan

Department of the Army
Pueblo Chemical Depot
45825 Highway 96 East
Pueblo, CO 81006
FEBRUARY 2014

UNCLASSIFIED

SUMMARY of CHANGE

PCD-R 50-3
Site-Specific Monitoring Plan

- February 2014
  - Added information to provide consistency and understanding to address STEL and VSL. Addressed title changes and format corrections; updated references.
- February 2013
  - Incorporates Colorado Division of Public Health and Environment Hazardous Materials and Waste Management Division (CDPHE-HMWMD) requested changes.
  - Updates position and organizational titles to coincide with recent PCD organizational restructuring.
  - Changed references to the WPL Excursion Plan to WPL Exceedance Plan due to verbiage changes to DA Pam 385-61, Toxic Chemical Agent Safety Standards.
- April 2011
  - Supersedes PCD-R 50-3, dated May, 2005 w/ changes
- Description of changes:
  - Updated signature page
  - Updated regulations with current
  - Deletes requirement for utilization of mobile sampling line (sample line 3) when conducting operations in aboveground storage magazines.
  - Further defines the use of Near Real Time (NRT) methodologies for Worker Population Limit (WPL) monitoring, and provides basis for WPL monitoring adjustments during non-standard work shifts (those less than eight hours).
  - Addition of DAAMS WPL monitoring for fixed site or long term operations.
  - Further defines responses for confirmed agent detection and alarm situations.
  - Addition of VSL terminology.
  - Addition of monitoring strategy for Occupational Health Clinic Vestibule, Passive Filters, Headspace, Waste and Personnel Quadrant Monitoring.

*PCD-R 50-3

DEPARTMENT OF THE ARMY
PUEBLO CHEMICAL DEPOT
45825 HIGHWAY 96 EAST, PUEBLO, CO 81006

PCD REGULATION
No. 50-3

FEB 26 2014

Chemical Operations Directorate

PCD SITE-SPECIFIC MONITORING PLAN

Supplementation of this regulation is prohibited unless prior approval is obtained from the proponent.

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1. Purpose

a. The purpose of this Pueblo Chemical Depot (PCD) Site-Specific Monitoring Plan (SSMP) is to provide policies, objectives, responsibilities, and procedural guidance to ensure that monitoring operations for distilled mustard (HD) and mustard-T mixture (HT) are conducted to provide personnel with the greatest level of monitoring protection.

b. This Monitoring Plan establishes procedures and policy for all masked, unmasked, and first entry operations in potentially harmful chemical environments. This Monitoring Plan is based on requirements defined in Department of the Army (DA) Pamphlet (Pam) 385-61; the U.S. Army Chemical Materials Agency (CMA) *Programmatic Monitoring Concept Plan* (MCP); and the PCD Standing Operating Procedures (SOPs) PU-0000-W-465, PU-0000-M-486, and PU-0000-R-491. If this Monitoring Plan is different from or conflicts with other codes or regulations from state and/or federal authorities, the CMA-Risk Management Directorate (RMD) is to be notified for resolution of the conflict and the most stringent requirement shall be followed, pending resolution.

c. This plan allows personnel to work inside an igloo, facility, or chemical munitions transport vehicle with appropriate levels of dress, as determined by applicable SOP, while performing toxic chemical agent mustard operations with proper monitoring being conducted.

d. The cardinal principle for an operation involving chemical agents or munitions is to limit the potential exposure to a minimum number of personnel, for a minimum period of time, to a minimum amount of the chemical agent consistent with safe and efficient operations. This includes prohibiting concurrent, unrelated work within the same work area.

e. This document defines requirements for PCD activities and operations relating to storage, treatment, and disposal of mustard and mustard mixtures. Requirements for closure activities will be provided under separate guidance. All other potential chemical hazards shall be addressed by the site in an industrial hygiene plan, Safety and Occupational Health Program Health Program, Chemical Accident/Incident Response and Assistance (CAIRA) Plan, or other similar documentation.

f. This plan prescribes PCD policy, responsibilities, and procedures for implementation of the monitoring plan. PCD stores the following HD/HT chemical ammunition: 4.2-inch mortars, 105mm cartridges and projectiles, 155mm projectiles, and the following non-ammunition items: Department of Transportation (DOT) bottles and chemically contaminated hazardous waste items. This plan covers all operations that may involve exposure to chemical agents. Storage, transportation, and facility drawings (Appendix E) represent typical storage configurations and operational set-up outlining sample line and point placement, as determined by the Monitoring Plan Working Group and utilizing the local Industrial Hygienist and U.S. Army Public Health Command (USAPHC) ventilation studies. The installation commander shall review and approve the monitoring plan prior to submittal to the CMA-RMD, ATTN: AMSCM-RDM, Aberdeen Proving Ground, Maryland 21010, for approval.

2. Scope

a. This Monitoring Plan specifically applies to the monitoring of toxic chemical storage igloos, facilities, transport vehicles, operations conducted in the toxic chemical storage area (G-Block), and the treatment and disposal of mustard and mustard mixtures at PCD. This Monitoring Plan generally applies to all PCD activities and operations relating to storage and shipment for disposal of chemical materiel and to those related to organizational elements, attached tenants, contractors, and visitors assigned to or working at PCD.

b. This plan outlines the requirements of chemical agent monitoring necessary to support PCD activities and to determine required level of protective clothing and equipment (PCE) which include Monitoring requirements for:

- Agent igloo operations
- Toxic Chemical Maintenance Facility
- Movement of toxic chemical munitions (TCM)
- Laboratory operations
- Filter unit monitoring
- PCE and tools
- Waste Streams
- Headspace monitoring
- Occupational Health Clinic Vestibule (DECON Room)
- Personnel Quadrant Monitoring

c. The objectives of this Monitoring Plan are to ensure mission personnel are provided the highest level of monitoring protection feasible. The procedures are designed to limit the potential exposure to a minimum number of people for a minimum period of time, consistent with safe and efficient operations. The samples collected will reflect, to the extent feasible, the worker's environment, and shall be based on airflow patterns within the structure where operations are being performed. Monitoring operations at PCD are designed to effectively identify chemical agent leakage in a timely manner necessary for implementation of emergency response to chemical accident/incidents (CAI) and remediation activities.

d. In implementing a reliable quality assurance (QA) system, the Site-Specific Laboratory Quality Control Plan (SSLQCP) will ensure the accuracy, precision, and reliability of monitoring data. Method validation studies are conducted on all standard monitoring operations. These validation studies document the precision, accuracy, sensitivity, specificity, and reliability of each procedure. Operators are provided adequate training and certification prior to operation of specific monitoring equipment. Any unexpected discrepancies and/or trends in chemical agent monitoring data will be managed IAW with the SSLQCP.

2.1 Monitoring Plan Updates

This PCD Monitoring Plan will be updated/revised within a time period specified by the CMA whenever: (1) the CMA *Programmatic MCP* is updated, (2) new regulatory guidance is promulgated, and (3) site-specific monitoring/safety requirements are implemented or changed. Formal site-specific monitoring plan changes shall be submitted to the CMA-RMD for approval. Because this Plan is part of the Waste Analysis Plan (WAP), it must be modified in accordance with 6CCR 1007-3, Section 100.63, and the Colorado Division of Public Health and Environment Hazardous Materials and Waste Management Division (CDPHE-HMWMD) will be notified of the modifications.

2.2 Waivers and Deviations

Requests for changes or deviations from the minimum requirements set forth in this Monitoring Plan will be addressed in accordance with (IAW) the PCD System Safety Engineering Management Plan (SSEMP). The SSEMP establishes the ground rules and methodology by which risk assessments will be developed, and overall risk management regarding waivers, exemptions, Certification of Risk Acceptance (CORA) development, decision authority and level of risk acceptance.

Any recommended changes to this document that conflict with the CMA MCP are to be addressed to CMA-RMD IAW the process described in the CMA MCP. PCD Chemical Operations Division will be the proponent for revisions, changes, and corrections to the PCD SSMP. CMA-RMD and the PCD Monitoring Working Group will be informed in writing of changes to this plan.

If the procedures of this plan are changed, a modification request will be submitted to the CDPHE- HMWMD Permitting Unit in accordance with 6CCR 1007-3, Section 100.63. CDPHE-HMWMD Permitting Unit will then review the modification request for approval.

2.3 Responsibilities and Authorities

a. The Monitoring Plan Working Group will:

(1) Consist of the following members: Safety Manager, Chief, Ammunition Surveillance Office, Chief, Chemical Operations Division, Supervisory Chemist, and the Industrial Hygienist. The Chief, Operations Division; Chief, Environmental Management Office; and Chemical Surety Officer may participate in working group meetings whenever issues are addressed concerning their areas of responsibility.

(2) Prepare and maintain this plan consistent with DA policy. Periodically review, and update as required, or when additional information becomes available and when procedures change. A working group meeting can be called by any member if he/she feels pertinent information or issues need to be addressed.

(3) Evaluate data from air flow studies.

b. The Safety and Occupational Health (SOH) Manager (or SOH) will:

(1) Recommend provisional changes to this plan that are not specifically required and/or mandated by DA policies.

(2) Advise the Monitoring Plan Working Group on Safety and Occupational Health issues relative to toxic chemical storage operations.

(3) Provide necessary support for conducting monitoring studies.

(4) Maintain copies of the air flow studies relative to this plan.

(5) Initiate CORA as applicable IAW with DA PAM 385-30 and PCD SSEMP.

c. The QASAS will:

(1) Attend Monitoring Plan Working Group meetings.

(2) Provide necessary support for conducting monitoring studies.

(3) Provide surveillance/quality control for toxic chemical operations to ensure the elements of this plan are properly executed and that inconsistencies relative to this plan are documented and provided to the appropriate office for corrective action/resolution.

d. The Chief, Chemical Operations Directorate and/or Supervisory Chemist will:

(1) Chair Monitoring Plan Working Group meetings.

(2) Attend Monitoring Plan Working Group meetings.

(3) Provide necessary support for monitoring studies.

(4) Suspend toxic chemical storage operations where results of ambient air agent monitoring indicate unacceptable exposure levels that place personnel at an unacceptable risk.

(5) Provide toxic chemical laboratory support to facilitate proper ambient air monitoring techniques as related to the Site-Specific Laboratory Quality Control Plan (SSLQCP).

e. The Industrial Hygienist will:

(1) Attend Monitoring Plan Working Group meetings.

(2) Recommend provisional changes to this plan relative to issues related to industrial hygiene principles.

(3) Assist in conducting airflow studies or train support elements to conduct air flow studies, provide input, and correlate results for the Working Group.

f. The Installation Commander will:

(1) Ensure sufficient resources are made available to provide the necessary elements for the execution of this plan.

(2) Approve this plan.

2.4 Monitoring System Requirements

Information obtained from monitoring will be used to ensure that PCD operations are being conducted properly to mitigate a chemical materiel release or personnel exposure.

Monitoring will be performed using instruments selected to detect and quantify the specific chemical encountered at its associated monitoring level. The instruments and methods used must be sufficiently sensitive to reliably measure threshold quantities at required levels. Monitoring methods will be selected to limit the frequency of interferences and will be performed in accordance with applicable SOPs. To accomplish these goals, instruments and methods used by PCD will include those specifically developed or approved by the Army to monitor chemical materiel under specific conditions in air, liquid, soils, and solids. All monitoring devices used for TCM detection shall satisfy the certification and performance requirements specified in the PCD SSLQCP. Other methods may be used if they are more sensitive, specific, or faster and meet the requirements of the existing methods for precision, accuracy, and reliability, as described in the CMA *Programmatic Laboratory and Monitoring Quality Assurance Plan* (LMQAP), and upon approval by DA Safety.

An overriding requirement of the design and development of monitoring systems is reliable day-to-day performance. Reliability, in this context, relates to the ability of the instrument or method to perform its intended function when called upon to do so. Selection of monitoring and sampling locations is also critical to an effective monitoring program. The sample lines must be positioned so that samples may be collected from representative points where any released chemical or other chemical hazard would likely be detected. Locations for ambient air monitors must be selected to provide optimum information and maximum protection for workers and the environment.

The monitoring instrumentation used to perform analysis is highly sensitive, and proper care should be taken to ensure that the appropriate environmental conditions and storage locations are chosen to protect the equipment. The monitoring systems that will be utilized are located in Table 5-1.

2.5 Types of Monitoring Employed for Storage Operations at PCD

The following types of monitoring are employed for operations at PCD:

a. *Historical Monitoring.* Historical monitoring is performed to measure very low concentrations of airborne analytes within the structure/area. Sampling is accomplished by the collection of an air sample over an extended period of time (usually the duration of a workday) and subsequent analysis is conducted offline. Historical monitoring is designed to trigger activities to investigate the source of contamination that may be found below the quantification limit of the near real-time (NRT) monitor. All historical samples must be analyzed within 72 hours of sampling termination. At PCD, the Depot Area Air Monitoring System (DAAMS) will be used for historical monitoring.

b. *NRT Monitoring.* Near Real Time (NRT) monitoring is conducted in areas where contamination is likely or possible, to determine airborne chemical concentration in the shortest amount of time at the monitoring level, commensurate with engineering controls and worker protection. An NRT monitoring system has the capability to automatically collect, analyze, and report/display the results within 15 minutes when chemicals are present at or above the exposure limit concentration. At PCD, the Miniature Continuous Air Monitoring System (MINICAMS®) will be used for NRT monitoring.

c. *Confirmation Monitoring.* Confirmation monitoring is performed to validate or invalidate a positive measurement from another monitoring system, using either an NRT or historical method.

If a historical method is used to confirm an NRT monitor, the confirmation method must be able to measure the same mass of analyte as would be collected if the sample were aspirated with air containing agent at the monitoring level during one sampling period of the NRT instrument in question.

Sampling is accomplished by collection of an air sample at approximately the same sampling point as the NRT monitor or historical sampling location. Confirmation monitoring is used for informational, qualitative, and/or quantification data reporting purposes in the event of a chemical materiel release. The confirmation sample shall be analyzed by a different method (column, detector, or different type of instrument) than the NRT or historical method to minimize the likelihood of detecting interferences. Confirmation monitoring relating to personnel safety/exposure or as specified in PCD SOPs PU-0000-W-465 and PU-0000-R-491 is required and shall be given priority over all routine sampling.

3. MONITORING STANDARDS AND CONTROL LIMITS

Airborne exposure limits (AELs) for HD at General Population Limit (GPL), Short Term Exposure Limit (STEL), Worker Population Limit (WPL) and Immediately Dangerous to Life and Health (IDLH) are listed in Table 3-1. The Vapor screening level (VSL) is defined as a vapor concentration term that is independent of time. It may be used to report the readout of a NRT monitor or be used to define the level of item cleanliness. The Short Term Exposure Limit (STEL) is the maximum concentration to which unprotected chemical workers may be exposed to for up to 15 minutes continuously. STEL is a 15- minute time weighted average (TWA); 1 STEL = 0.003mg/m3. A STEL is not achieved until the sampling time is at least 15 minutes; therefore, it would require at least 3 cycles to achieve the time to qualify as a STEL. While the required concentration may be achieved during the first cycle, monitoring/IH, and safety personnel must perform a calculation based on the level of the alarm and estimated amount of time personnel were present in the alarming environment to determine if an actual STEL (15 minute average concentration) exposure has been achieved. To avoid a MINICAMS® alarm

from being interpreted as a STEL exposure, the display of all MINICAMS® monitoring at the STEL exposure level will be configured to display VSL. (CMA Memorandum subject: Request Amendment to or Clarification of Existing CMA Programmatic Guidance for Short Term Monitoring and Reporting, dated 16 Nov. 2005)

Table 3-1. AELs for HD[a]

Sulfur Mustard (HD) Criteria	GPL	WPL	WPL	WPL	STEL[b]	IDLH[d]
Exposure Level	0.00002 mg/m^3	0.0004 mg/m^3	0.0008 mg/m^3	0.0016 mg/m^3	0.003 mg/m^3	0.7 mg/m^3
Averaging Time	12 hour	8 hours	4 hours	2 hours	≤15 minutes	30 minutes
Recommended Monitoring Method	Historical	Historical[c] or near real-time	Historical[c] or near real-time	Historical[c] or near real-time	Near real-time	Near real-time

Notes:

a Although the Centers for Disease Control and Prevention (CDC) do not specifically recommend additional reduction factors for statistical assurance of action at the exposure limit, exposures to sulfur mustard should be minimized given the uncertainties in risk assessment, particularly as related to characterizing carcinogenic potency.

b To be evaluated with a near real-time instrument using shortest practicable analytic cycle time. No more than one exposure per work-shift.

c Historical monitoring typically is used for time-weighted average (TWA) monitoring where the sample analyzed represents an extended time period. Results are not known until laboratory analysis is completed after the sampling event. PCD tracks the historical frequency of all confirmed detections above the WPL to ensure workers involved in agent operations are not routinely exposed to mustard agent above the WPL. Any exceedance of mustard agent above the WPL is managed in accordance with the PCD WPL Exceedance Plan listed in Section 8 of this plan.

d Immediately dangerous to life or health (IDLH) is a 30-minute TWA. The 30-minute period is not meant to imply that anyone should stay in the environment any longer than necessary; in fact, every effort should be made to exit immediately.

3.1 AELs for Chemical Agents

Values identified in Table 3-1 are Centers for Disease Control and Prevention (CDC) final recommendations to set AELs for HD/HT. This table provides maximum concentration values not to be exceeded for a given period of time, depending on the level of protection worn by personnel at PCD. The STEL values are short-term exposure limits and the WPL values are long-term exposure limits. Occurrences at or above the NRT VSL alarm level of 0.25 VSL (0.00075 mg/m^3) will require immediate egress. If the NRT 4-hour WPL alarm level of 0.70 WPL (0.00056 mg/m^3) or the DAAMS 8-hour WPL reportable limit of 0.70 WPL (0.00028 mg/m^3) is met or exceeded, refer to the WPL Exceedance Plan in Section 8 for corrective action.

Note: The relationship between concentration (C) and exposure time (t) is derived for vapors and gases of HD/HT as follows: $C^n t = k$, where k = constant and $0.8 \leq n \leq 3.5$. This Monitoring Plan assigns n = 1 (Haber's Law) for the WPL in the range of 2 to 12 hours. This assignment is both reasonable and practical: the 8-hour WPL is actually derived from a 40-hour per week exposure limit with no recovery period considered; the WPL incorporates uncertainty factors so that it is not a precise value; and Haber's Law is more easily understood because it is computationally simple.

3.2 Exposure Limit Implementation Concept

PCD will conduct chemical operations IAW the monitoring requirements provided in Section 4. Monitoring levels for operations shall be based on potential time of exposure and shall consider the maximum use concentration for a given respirator assigned protection factor (APF). Under these conditions, different monitoring levels may be implemented, depending on the level of PCE used and implementation of administrative controls to reduce potential exposures. The frequency of WPL monitoring will be based on Industrial Hygiene (IH) best practices (Appendix G). For chemical agent environments in industrial operations and applications, the M40A1 mask conforms to the Occupational Safety Health Administration's (OSHA) criteria for designating all full-face, air-purifying negative pressure respirators with an APF of 50. M40A1 mask use is authorized for use in HD/HT environments ≤2.0 STEL as based on hazards associated with the use scenario, airborne concentration, and the task duration. Daily maximum use limits for the M40 mask in environments above the WPL are in accordance with DA Pam 385-61 Table 4-2. The decision to use the M40A1 mask in a chemical agent (mustard) environment must be supported by a risk assessment that supports the respirator decision logic. When using the M40A1 mask in mustard environments, leaders must ensure that controls are in place to prevent worker exposure above the established limits shown in Table 3-1.

3.2.1 WPL Monitoring

a. Mobile Monitoring. NRT monitors will be used to fulfill WPL monitoring requirements during routine operations. PCD must be able to demonstrate the ability to monitor at the WPL to facilitate unmasked operations. The PCD monitoring program's alarm level for monitoring at the VSL exposure level has been designated at 0.25 VSL (0.00075mg/m^3). The alarm level for the 4-hour WPL exposure level has been designated at 0.70 of the 4-hour WPL (0.00056mg/m^3). IAW CMA guidance dated March 8, 2005, and CDC guidance dated March 24, 2005, PCD has adjusted WPL monitoring to meet a non-standard work shift of less than 8 hours and utilizes a 4-hour NRT WPL exposure level of 0.0008mg/m^3.

b. Fixed Site Monitoring. An 8-hour DAAMS method will be used to fulfill WPL monitoring requirements during fixed site operations. The WPL DAAMS sampling line will be collocated with the VSL NRT sampling line and can be used for confirmation of VSL alarms. The reportable limit (RL) for the 8-hour WPL exposure level has been designated as 0.70 of the 8-hour WPL (0.00028 mg/m^3).

4. MONITORING

4.1 Introduction

Monitoring shall be used to evaluate the overall effectiveness of engineering and administrative controls, and when PCE is used, monitoring shall be used to ensure that exposure levels are not exceeded.

4.2 Monitoring Requirements for PCD Operations

During operations, if a positive reading is detected at or above the alarm level, the workers will mask (during unmasked operations) and exit the area. VSL and WPL NRT monitors used at PCD will provide an audible and visual alarm when the alarm level is met or exceeded. When a positive reading is obtained from a monitoring instrument, a different type of method detection will be utilized for agent confirmation, if required. See paragraph 4.2.4j for more information on confirmation monitoring.

Placement of each sampling point is based on potential chemical migration points and shall be verified via the use of airflow tests. When monitoring supports personnel protection, monitoring locations should be in close proximity of personnel work activities.

Details of monitoring requirements and locations are provided in the following paragraphs. A summary of agent storage structure monitoring requirements is provided in Table 4-1.

4.2.1 Process Areas

Chemical agent contamination, in the form of vapor or liquid/vapor, is expected or more likely to occur in the process areas. Monitoring of process areas provides information on the level of contamination and protects workers making entries into these areas. Continuous NRT monitoring at the VSL will be utilized. No confirmation monitoring is necessary, because the presence of chemical agent is expected.

4.2.2 Workspace Process Areas Monitoring

Single-contained Toxic Chemical Munitions are present, and personnel perform work on a routine basis, in the workspace process area. Chemical agent contamination is not expected, but because of the nature of the operations being performed, there is a potential for contamination. Workspace process areas require continuous NRT monitoring at the VSL/WPL (for unmasked operations). Confirmation monitoring is required if detection occurs during open door operations.

4.2.3 Workspace Process Areas/Process Area Operations

Masked and unmasked operations will be conducted as follows:

a. *Unmasked Operations.* The following standards must be followed for unmasked operations:

(1) Completed first entry and documented monitoring results are below alarm level for the entire first entry process.

(2) Continuous NRT monitoring, with alarm capability, will be conducted throughout storage structure operation.

(3) WPL monitoring will be performed in conjunction with VSL monitoring.

(4) Communication between work crew and monitoring systems operator must be maintained.

(5) All personnel who work unmasked must have an M40A1 protective mask or escape self-contained breathing apparatus (SCBA) within arm's reach IAW PCD-R 40-20, Respiratory Protection Program.

b. *Masked Operations.* First entry monitoring must be completed. The concentration of chemical agent will determine the level of dress required. Continuous VSL monitoring must be conducted using an NRT monitor with alarm capability to ensure airborne concentrations are acceptable for the level of dress worn by personnel.

c. *Movement of TCM.* Movement of TCM will be performed IAW paragraph 4.2.9 of this document.

Table 4-1. Requirements for Agent Storage Structure Operations

Monitoring Location or Functional Activity	NRT Monitor	NRT Confirmation	Notes/Comments
Process Areas/Workspace Process Areas			
First Entry Masked Operations	VSL	VSL	Confirmation is required within 30 minutes.
Workspace Process Area Unmasked Operations During munitions movement Inside of Open Igloo without Munition Movement to Exterior of Igloo	VSL/WPL	VSL/WPL	WPL monitoring is required during unmasked operations utilizing an NRT monitor. The WPL concentration will be based on the time period of operation.
Workspace Process Area Normal Masked Operations During munitions movement Inside of Open Igloo without Munition Movement to Exterior of Igloo	VSL	VSL	First entry is completed and the agent concentration determines level of PCE.
Process Area Leaker isolation/containerization	VSL	VSL	Confirmation monitoring is not necessary because the presence of chemical agent is expected
Igloo Monitoring	VSL	VSL	Performed at a minimum weekly at VSL exposure level.
Powered Storage Filter Midbed	VSL	VSL	Performed immediately after placement into service and once every 24 hours during operation.
Powered Storage Filter Exhaust	VSL	VSL	Performed only after confirmed readings detected at or above the VSL in the active filter midbed.
Passive Storage Filter Midbed	VSL	VSL	Performed when confirmed readings at or above 0.25 VSL have been detected inside the igloo.
Passive Storage Filter Exhaust	VSL	VSL	Performed only after confirmed readings detected at or above the VSL at the midbed location in the active filter.

Notes:

NRT Confirmation will be performed using a NRT or historical method. A NRT monitor will be used for 4-hour WPL monitoring. Cumulative unmasked operations will not exceed 4 hours in 1 day.

If unmasked operations are planned to exceed 4 hours in 1 day, then an 8-hour WPL collocated DAAMS method will be utilized.

4.2.4 Agent Igloo Monitoring

a. Two MINICAMS will be utilized in conjunction with two heat traced lines (HTL) and/or unheated Teflon sampling lines, to monitor both sample lines during chemical operations. HTL lines will be utilized IAW SOP PU-0000-R-491.

b. Only stainless steel or Teflon connections will be used inside the igloo for sample line flow.

c. Sampling lines will be purged with compressed air semiannually to prevent dirt/particle buildup.

d. Fixed sample points will remain in place IAW Appendix E. Two fixed sample lines will be utilized in the igloo (see figure in Appendix E). Sample line 1 (front) will be positioned approximately 20 feet from the igloo door and approximately 5 feet from the floor down the center/main aisle. Sample line 2 (rear) will be positioned approximately 20 feet from the rear of the igloo and approximately 8 feet from the floor down the center/main aisle. The NRT monitor sampling lines will be connected to both the front and rear fixed igloo lines from the headwall using Teflon or stainless steel connections.

e. *Fixed Monitoring Points.* The two monitoring location points for HD monitoring are defined as follows:

(1) Two 1/4-inch outer diameter Teflon sample lines (not heat-traced), permanently marked front and rear, will run from the outside of the structure through the PVC at the headwall, through the floor drain to the interior of the structure.

(2) Front and rear fixed sample lines will remain in close proximity to the interior side of the headwall, towards the center of the structure, without hindering access to the door; and will be attached overhead to the conduit and placed at locations designated in Section 4.2.4(d). Approximate lengths of the front and rear fixed sample lines will be 40ft and 80ft, respectively.

f. Real Time Analytical Platform (RTAP) HTLs will be connected to the exterior igloo lines. Exterior igloo lines are enclosed within a PVC composed container and are attached with stainless steel Swagelok unions. The unions will be capped when not in use.

g. *Sample Line/Teflon Tubing Requirements.* Sample line and Teflon tubing requirements for monitoring are defined as follows:

(1) For HD/HT monitoring operations, the Chemical Operations Directorate will purge all sampling lines with compressed air for 1 minute on a semiannual basis.

Note: The compressed air purging process will not be conducted within 10 minutes of any monitoring process.

(2) Spliced sample lines are not normally allowed, but in cases where this requirement cannot be met, stainless steel Swagelok unions will be utilized to connect sampling lines.

The stainless steel manifold utilized for exterior DAAMS monitoring allows parallel DAAMS monitoring and interfaces the DAAMS vacuum source and the igloo sample line.

h. The MINICAMS will be operated IAW SOP PU-0000-R-491. Monitoring will be conducted concurrently at both the front and rear sample lines. If readings are below the alarm level, the igloo door may be opened and first entry monitoring will be completed IAW SOP PU-0000-M-486, to include a thorough inspection for abnormal conditions.

i. If at any time the MINICAMS alarm sounds, personnel in the exclusion area will immediately don their protective masks, exit the igloo, and proceed in accordance with SOP PU-0000-M-486.

j. If the readings are at or above the alarm level, the Operations Center will be notified immediately and confirmation sampling will be started within approximately 30 minutes of the initial reading using an NRT (different column or detector) or DAAMS method. DAAMS tubes, if utilized, will be placed on suspect line(s) that initially produced positive agent readings.

k. *Unmasked Procedures.* IAW Army Regulation (AR) 385-10, *The Army Safety Program,* and DA Pam 385-61, *Toxic Chemical Agent Safety,* personnel can conduct operations unmasked if the following conditions are met:

(1) Continuous NRT monitoring with alarm set at 0.25 VSL (0.00075 mg/m^3) and 0.70 WPL (0.00056 mg/m^3) of the 4-hour WPL (0.0008 mg/m^3).

(2) M40A1 protective mask is in the slung position.

(3) Exposure potential must be limited to the extent practicable through engineering controls and work practices.

(4) All requirements of this monitoring plan must be followed.

(5) Completed first entry monitoring and monitoring results do not exceed the alarm level.

(6) Sampling lines will be positioned IAW this document.

(7) The safety person or lead will immediately notify personnel to don masks and exit igloo, if agent is detected at or above the alarm level.

(8) Personnel will follow direction of crew leader if he/she believes there is a hazard or a reason to mask and/or exit the igloo.

4.2.5 Requirements for Working in Agent Igloos

a. *First Entry Monitoring.* Prior to entry into areas containing chemical agents or agent contamination, igloo monitoring will be performed utilizing NRT monitoring equipment with alarm capability. The PCE level for entry will be selected based on initial NRT reading. If NRT monitoring indicates that agent concentrations are below the alarm level, first entry monitoring may be conducted in the level of dress IAW Personal Protective Clothing and Equipment (PCEPPE) for H Series Toxic Chemical Agents, Level D with boots, gloves, and mask worn. If confirmation monitoring indicates agent concentrations exceed the alarm level, 1000CFM Filter emplacement will be accomplished, and appropriate PCE must be worn when entering the igloo.

b. *Distal Line Testing.* All igloo sampling lines will be challenged at the distal end every six months to demonstrate a recovery of ±40 percent of the target concentration (at the applicable monitoring level). If this requirement is not met, a causative investigation will be initiated to determine the sample line failure and sample lines will be replaced, if necessary.

c. *Monitoring During Operations.*

(1) After first entry monitoring has been performed, personnel wearing appropriate PCE IAW applicable SOP may enter the area to work.

(2) NRT monitoring with alarm and printout capability will be conducted in accordance with this monitoring plan.

4.2.6 Monitoring Equipment Room

a. See Appendix F, Monitoring Equipment Room, for placement of monitoring points.

b. The Monitoring Equipment Room containing protective clothing or equipment will be monitored to the 4-hour WPL with MINICAMS prior to opening the door, provided agent was detected during operations. Procedures for monitoring equipment/clothing will be IAW SOP PU-0000-R-491.

c. All protective clothing, tools and equipment will be heated to a minimum temperature of 70°F for a minimum time of 4 hours prior to conducting monitoring.

4.2.7 Building 487, Chemical Laboratory

a. See Appendix F, Building 487, Chemical Laboratory for sample line placement/monitor points.

b. The Chemical Laboratory and Laboratory Filter Unit will be monitored quarterly. The filter unit will be monitored mid-bank (between absorbent filter banks) using the filtering ports with an NRT monitor. If agent is detected at or above the alarm level between absorbent filter banks, the filter exhaust will be monitored on a continuous basis until a replacement filter can be installed. If agent is detected at the filter exhaust, the filter will be shut down and the building sealed. Monitoring requirements for laboratory operations are shown in Table 4-2.

Table 4-2. Requirements for Laboratory Operations Monitoring

Laboratory Operations		NRT Confirmation	Notes/Comments
Laboratory	VSL	VSL	
Laboratory Filter	VSL	VSL	Filter leak test required annually. Appropriate filter monitoring at the VSL is performed prior to testing.

4.2.8 Building 491, Toxic Chemical Maintenance Facility

Sample line placement is determined by the conditions at the time of operation (highest area of potential contamination) see Appendix F. The filter unit will be monitored as described in paragraph 4.2.11 of this plan.

4.2.9 Monitoring Procedures During Movement and Transport of TCM

In addition to the monitoring required in paragraph 4.2.2, the following monitoring requirements will also apply.

a. Unless approved by the Commander (with appropriate safeguards in place) no chemical munitions or container, in any configuration, will be removed from a structure until the structure has been monitored and the results are below the VSL alarm level.

b. Upon arrival at destination and prior to opening, the Modified Ammunition Van (MAV) will be headspace monitored IAW SOP PU-0000-R-491, and the results will be below the VSL/WPL alarm levels before unloading operations begin. RTAP HTLs/Teflon sample line will be connected to the outside monitoring points and sampling accomplished prior to opening the cargo doors – see Appendix F. If reading is below the alarm level, doors may be opened by

personnel in level of dress specified by the SOP PU-0000-M-486. If readings are at or above the alarm levels, the 1,000 (cubic feet per minute) CFM filter unit will be used to filter the MAV until the readings are lowered to an acceptable level. Procedures will be followed in accordance with the applicable SOP.

4.2.10 Mobile Personnel Decontamination Station (MPDS)

Station C of the MPDS will be monitored to the VSL using the provided monitoring port (Appendix F) with an NRT monitor IAW SOP PU-000-M-491 during emergency response exercises and events. If positive readings are obtained in Station C, then monitoring for potential contamination will be performed starting in the control room and working backwards towards station A. Decontamination will be performed as needed. The MPDS utilizes a cascaded ventilation system that maintains a negative pressure within potentially contaminated areas of the MPDS, and captures any contaminated vapors in a carbon filter. The system consists of ducting, filter housing, a prefilter, a high efficiency particulate air (HEPA) filter, one carbon absorber, a motor/blower, a control damper, a filter exhaust extension, and a rain flapper. The filter train has two sets of sample ports to permit periodic monitoring of containment levels in the air stream. The upstream sampling location is in the front of the prefilter and the HEPA filter, while the downstream sampling location is in the outlet duct. The latter should be used to detect agent break through.

4.2.11 1000 Cubic Feet Per Minute (CFM) Filter Units

Filter units will be monitored mid-bank (between absorbent filter banks) using the provided filtering ports (Appendix F) with an NRT monitor IAW SOP PU-0000-R-491 when the unit is first installed on a structure and at least once every 24 hours. More frequent monitoring may be justified based upon the concentration of the chemical agent being filtered. If agent is detected at or above the alarm level between absorbent filter banks, the filter exhaust will be monitored on a continuous basis until a replacement filter can be installed. If agent is detected at the filter exhaust, the filter will be shut down and the vents on the structure will be closed until a serviceable filter unit can be installed and activated.

4.2.12 Weekly Monitoring of Igloos

Weekly monitoring will be performed in all igloos within G-block where TCM/Hazardous Waste is stored. The minimum requirements for the igloos are outlined in Table 4-1. Because the purpose of monitoring is to detect leaking munitions or over-packs, NRT monitoring shall be performed at the VSL. Confirmation monitoring will be performed for readings at or above the alarm level. Confirmation of subsequent readings from the same structure is not necessary.

4.2.13 Passive Filter Monitoring for Agent Igloos

Rear vent and front passive filter units will be monitored mid-bank (between absorbent filter banks) using the provided filtering ports (Appendix F) with an NRT monitor IAW SOP PU-0000-R-491. Monitoring is required mid-bank on passive filter units when readings at or above the VSL alarm level inside the igloo have been confirmed. If agent is detected and confirmed at or above the alarm level between absorbent filter banks, monitoring will be conducted at the uppermost monitoring point on the rear vent passive filter or the low static pressure port on the front passive filter to determine if agent has migrated to the outside environment. Regardless of the results of passive filter monitoring a 1000 CFM filter unit will be installed and activated on all igloos with confirmed readings at or above 0.25 VSL.

4.2.14 Facility and Storage Building Decontamination

Prior to unrestricted release of agent operating facilities or storage facilities/igloo to the general public, the facilities must be certified to the general population limit (GPL). Refer to PCD-R 50-4, Equipment Decontamination Plan for specific procedures.

4.2.15 Waste Stream Monitoring

Wastes will require agent screening or assessment for chemical agent materiel to document decontamination process effectiveness and categorize and define waste streams prior to offsite shipment and disposal. Waste streams generated during site operations shall be screened or assessed for residual chemical agent materiel IAW SOP PU-0000-W-465, SOP PU-0000-R491, SOP PU-0000-R-486 and the Waste Analysis Plan.

a. Liquid waste shall be screened/ assessed to verify that chemical agent materiel concentrations are below negotiated/approved levels by sampling and analysis. Liquid waste streams include, but are not limited to, the following:

(1) Solutions used for decontamination

(2) Laboratory waste solutions and other chemicals

b. Solid waste shall be agent-screened for surface contamination by headspace monitoring. Solid waste streams include, but are not limited to, the following:

(1) Secondary waste (dunnage/packing materials, CWM debris, used PCE, tools, etc.)

(2) Filters and filtration media (charcoal, etc.)

4.2.16 Headspace Monitoring

Headspace monitoring is an agent screening process that measures off-gassing agent vapor from a solid material. Headspace monitoring is conducted by confining the item to an enclosed area or closed container without ventilation that allows sufficient vapor to be extracted and ensures a representative sample is collected for analysis. Efforts shall be made to eliminate dilution by external air. When specified for the application, e.g. PCE, an unventilated pre-monitoring hold-time of at least 4 hours and minimum temperature of 70°F for the confined item shall apply. Sampling and analysis of the vapor headspace may be performed by an NRT or historical method. At PCD, agent screening by headspace monitoring may be used to determine operational constraints, waste disposition, handling precautions and during closure activities. Headspace monitoring is limited in measuring the level of agent contamination on porous materials due to the potential for the material to slowly off gas at low levels. In cases involving porous materials, the specific circumstances of each case will be reviewed in determining proper handling and disposition of the material.

4.2.17 Occupational Health Clinic (OHC) Vestibule Monitoring (Decontamination Room)

During processing of a casualty through the OHC vestibule, NRT monitoring at the VSL for an unmasked worker will be performed. Confirmation monitoring is not required.

4.2.18 Personnel Quadrant Monitoring

Personnel quadrant monitoring is a vapor screening method that will be performed during chemical emergency response events to verify the decontamination process effectiveness of personnel that have been contaminated or potentially contaminated with chemical agent.

Personnel quadrant monitoring will be conducted IAW SOP PU-0000-R-491. The person's body is divided into four quadrants (front upper, front lower, back upper, back lower) and each quadrant is monitored for an equal amount of time to the VSL with an NRT monitor. Confirmation monitoring is not required.

5. DESCRIPTION AND REQUIREMENTS OF MONITORING AND SAMPLING EQUIPMENT

This section summarizes the sampling and analytical equipment required for verifying control of agent migration in air and in process effluents for PCD activities. As a starting point, all hardware associated with process monitors, air monitoring equipment, and laboratory equipment will be maintained in accordance with the manufacturers' operations and maintenance (O&M) manual recommendations.

Table 5-1 provides descriptions, operational requirements, and preventive maintenance requirements for PCD operations. Table 5-2 provides equipment requirements for support gases.

Table 5-1. Description and Requirements for Monitoring and Sampling Equipment

Monitoring Equipment	Operational Components	Manufacturer Specifications	Minimum Operational Requirements	Preventive Maintenance
NRT Monitors: • MINICAMS® NRT Detectors: • FPD	Operational Components: • Preconcentrator Tubes (PCT) • Capillary Columns Support Gases: • Hydrogen Generators • Nitrogen/Air Generators • Moisture Traps (as required)	Electrical Requirements: • Critical NRT monitors equipped with UPS[a] • Power is provided in accordance with manufacturer specifications Temperature: • Use operational performance characteristics to determine if the NRT is operating within control • RTAP doors must remain closed at all times, except during personnel entry/egress	• Routine Calibration • Daily Challenges • TMDE calibration of digital mass flow meter • The sample exhaust must be filtered, returned to the sampling point, or vented to appropriate engineering controls	• PCT is replaced during instrument PM, as a corrective action or as needed, based upon challenge performance

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Table 5-1. Description and Requirements for Monitoring and Sampling Equipment (Continued)

Monitoring Equipment	Operational Components	Manufacturer Specifications	Minimum Operational Requirements	Preventive Maintenance
Depot Area Air Monitoring System (DAAMS)	DAAMS Operational Components: DAAMS Tenax® Tubes: • 6 mm collection tube • 3 mm transfer tube DAAMS Manifold: • Designed to provide a directional sample flow pattern and distribute the sample flow NO_x Filter: • Chromosorb moisture detection disk • Change out frequency is based on a site-specific basis	Power Requirements: • Power is provided in accordance with manufacturer specifications • Critical DAAMS equipped with UPS[a] Temperature: • Temperature is maintained to minimize condensate formation	Vacuum Pumps: • Used in conjunction with a needle valve • The sample exhaust must be filtered, returned to the sampling point, or vented to appropriate engineering controls Hoses: • Silastic tubing must not be used upstream of the DAAMS tube Manifold: • Fabricated from stainless steel • Units that demonstrate detectable leaks, poor flow rates, or broken sections are repaired or replaced	• Daily checking of flow rates, fittings, and ferrules • Vacuum pump, preventive maintenance will be performed in accordance with manufacturer specifications • Require air, gas flow through tube and thermal desorption of tube for conditioning

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Table 5-1. Description and Requirements for Monitoring and Sampling Equipment (Continued)

Monitoring Equipment	Operational Components	Manufacturer Specifications	Minimum Operational Requirements	Preventive Maintenance
GC Analytical Systems: • FPD	Operational Components: • Sample inlet • Megabore column • Support gases • Chemstation Software • Thermal transfer system	Power Requirements: • Power is provided in accordance with manufacturer specifications • Power board is 120 volts alternating current Room Temperature: Between 68° and 80°F during operational periods	• Exhaust is vented to appropriate engineering controls if required by safety analysis • Temperature, flow rate, and desorption time shall be optimized on a site-specific basis • Routine Calibration • Daily Challenges	• Performed on an "as-needed basis" in accordance with the O&M manuals • Quarterly basis using Lab Form 017

Notes:

a The uninterruptible power supply (UPS) must have brown-out protection and constant voltage output and must operate the instruments for at least 15 minutes during a power failure.

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Table 5-2. Support Gases Equipment Requirements

Support Gases	Purifiers	Leak Detectors	Compressed Gas Regulators	Compressed Gas Line
May include: • Hydrogen • Air • Nitrogen Support gases are handled and stored in accordance with manufacturer recommendations.	Moisture and Hydrocarbon Traps (as needed): Frequency of change outs are: • Based on instrumentation performance	May include: • Simple soap solution • Electronic leak detector Utilization: • Completed in accordance with manufacturer specifications and requirements	• Will be two-stage regulators or equivalent	• Will be pre-cleaned tubing • All fittings will be Swagelok fittings or equivalent.

Note:

a Gas generators will be operated in accordance with manufacturer specifications.

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6. MONITORING DOCUMENTATION REQUIREMENTS

PCD operations are required to prepare and retain a variety of documentation supporting the monitoring and laboratory efforts implemented at the site. Documentation requirements for laboratory/monitoring operations are presented in the PCD SSLQCP.

7. PROCEDURES FOR DETERMINING AND REPORTING POSITIVE CHEMICAL AGENT MATERIEL RESPONSES

7.1 Introduction

Due to the low monitoring levels required for PCD operations and the potential for false positive or negative readings, the PCD laboratory/monitoring group must follow a strict protocol for reporting any chemical materiel measurements at or above the alarm level for Class I NRT methods or reportable limit for Class I historical methods. All methods employed at PCD are Class I methods and must meet the acceptance criteria as stated in the PCD SSLQCP. When reporting the detection of chemical agent materiel measured by multiple methods, the primary method concentration shall be the reported value, except in the case of confirmed WPL exceedances where the highest measured concentration shall be reported. Monitoring results reported externally shall be reported as a concentration in mg/m^3 with the sampling time (when appropriate) and instrument type used.

7.2 Alarm Setpoints/Reportable Limits

When a method response at or above the alarm setpoint or reportable limit is encountered, corrective actions and, if necessary, protective measures, shall be implemented and the data shall be reported either before or after confirmation by an alternate method, IAW the SSLQCP, SOP PU-0000-W-465, and SOP PU-0000-R491. All alarms shall be considered true until other measures (i.e. confirmation, verification of process controls) indicate otherwise.

7.3 NRT or Historical Method Response with Confirmation

All chemical materiel alarms, detections, and measurements shall be considered valid until indicated otherwise by confirmation, verification of process controls, etc. The confirmation method may use the same or different sampling method other than the primary method. The analytical technique shall be different from that of the primary method, for example, a different column or an instrument with a different detection principle. The confirmation sample shall be taken from approximately the same sampling location and time frame as the primary sample. The confirmation method shall have sufficient sensitivity to detect or measure agent over the primary method's concentration range. Confirmed chemical materiel shall be documented IAW the SSLQCP.

When agent exposure is confirmed to exceed the WPL, the WPL Exceedance Plan is initiated.

8. WPL EXCEEDANCE PLAN

The following provides information that will be used to investigate, identify, and control the source of each identified exceedance. A WPL exceedance is defined as WPL readings above 1.0 WPL based on the duration of the workday. A WPL Exceedance Board will be convened to provide the required response to cases where the WPL is exceeded. If a WPL exceedance coincides with readings greater than or equal to 0.25 STEL/VSL, the board will not meet because current SOPs for monitoring results greater than or equal to 0.25 STEL will apply. Procedures for monitoring results greater than or equal to the alarm level of 0.25 VSL direct the

operators to initiate leaker isolation steps, e.g., donning of appropriate PCE, removal from area and emplacement of a 1000 CFM filter.

When monitoring indicates readings greater than or equal to 1.0 WPL, or the WPL MINCIAMS alarms at any time during the operation above the 0.70 WPL (0.00056 mg/m^3) alarm level, the area or areas involved will be restricted promptly and adequate respiratory protection will be required for entry to the igloo until the cause is evaluated and corrected.

The WPL response plan will be executed as follows:

(1) To investigate, identify and control the source of each exceedance

(2) To provide additional response for ensuring worker health and safety

(3) Will include a list of organizations to be notified when an exceedance occurs

(4) Shall be approved at the same level as the SOPs

A WPL Excursion Board will be convened to:

(1) Investigate the cause

(2) Recommend corrective or mitigating actions

(3) Ensure the proper notifications are made

The board, as a minimum, will consist of:

(1) Representative from the SOH Office (Chairperson)

(2) Representative from Surveillance Branch

(3) Chief, Chemical Operations (or designee)

(4) Industrial Hygienist (or designee)

(5) Toxic Material Handler Representative (Leader or Supervisor)

(6) Laboratory/Monitoring Representative (Chemist or Supervisor)

(7) Public Affairs Office (PAO)

(8) Civilian Executive Assistant

(9) Representative from Occupational Health Clinic

The board will ensure that the following information will be posted, informing all personnel of:

(1) Location of the exceedance

(2) Period of time during which exceedance occurred

(3) Name of the chemical agent

(4) WPL for chemical agent monitored in mg/m^3

(5) Amount exceeded in mg/m^3

(6) Statement of proposed action to limit future exceedances

(7) Safety point of contact (POC) with phone number

(8) Medical POC with phone number

(9) Statement concerning the health significance of the exceedance, with concurrence of the competent medical authority

The notice of exceedance will be provided to all affected personnel and the Colorado Department of Public Health and the Environment Hazardous Materials and Waste Management Division (CDPHE HMWMD) as soon as possible after the determination of the exceedance. The notice may be delivered electronically, posted on a bulletin board near the location of the exceedance, or any other method that ensures affected personnel are notified of the required information. The notice of exceedance shall be posted for 3 working days, or if the condition leading to the exceedance is identified, until that condition is abated, whichever is later.

Competent medical authority and members of the WPL Exceedance Board will be notified of the exceedance and provided the following:

(1) Location of the exceedance

(2) Period of time during which exceedance occurred

(3) Name of chemical agent observed

(4) WPL for chemical agent monitored in mg/m^3

(5) Amount of exceedance in mg/m^3

(6) Statement of proposed action to limit future exceedances

(7) Safety POC with phone number

The board Chairperson will ensure a report for record is prepared that summarizes the actions taken to resolve each exceedance event. A copy of this report will be provided to CDPHE HMWMD. Instances of WPL exceedances will be reviewed and/or analyzed at least annually to determine any trends.

9. LIMITING CONDITIONS OF OPERATION (LCOs)

9.1 Introduction

All operations are governed by LCOs or similar operational requirements. The site manager/designee will determine that all LCOs have been achieved on a daily basis. The following paragraphs present minimum LCOs for laboratory/ monitoring group activities at PCD.

9.2 Analytical Systems

LCOs for analytical systems include requirements for personnel, calibration and quality assurance/quality control (QA/QC), the PCD laboratory/monitoring group, and instrumentation. LCOs are presented in Table 9-1.

Table 9-1. Laboratory LCOs

Personnel[a]	Calibration and QA/QC	PCD Laboratory Facility	Instrumentation[a]
• Sufficient Certified Laboratory Technicians • Sufficient Certified Laboratory Personnel	• Calibration and Challenge Standards Current • Operational[b] Instruments Calibrated and in Control	• Ventilation System (Fume Hoods) Operational • HVAC in Operational Limits (68° to 80°F) • Electrical Power Operational • Eye Washes and Safety Showers Operational • Communications Operational[d]	• Sufficient Number of Analytical Instruments Operational • Sufficient Support Equipment Operational[c] • Sufficient Historical and Confirmation Sampling Equipment Operational

Notes:

a Sufficient numbers of personnel and equipment are determined by the Chemical Operations Chief or designee based on operational experience. For open door operations, a minimum of 1 certified operator and 1 fully functional GC/FPD is required to maintain confirmation capability.

b Operational instruments are those that are in the field, online, and are necessary to support daily operations. For open door operations, a minimum of 1 fully functional GC/FPD is required to maintain confirmation capability.

c Support equipment includes vacuum pumps, pH meter, etc.

d Communications can be in the form of telephone or radio communications.

9.3 Monitoring and Sampling Systems

LCOs governing personnel, calibration and QA/QC, and instrumentation for monitoring and sampling systems are identified in Table 9-2.

Table 9-2. Monitoring LCOs

Personnel[a]	Calibration and QA/QC	Instrumentation[a]
• Sufficient Certified NRT Monitor Operators • Sufficient Certified Electronic Technicians/ Monitoring System Operators/Mechanics • Sufficient Certified Laboratory Personnel	• Agent Calibration and Challenge Standards Current • Operational[b] Instruments Calibrated and in Control • Operational[b] Method in Control (QPs)	• Sufficient Currently Approved NRT Monitors are Operational • Sufficient Support Equipment Operational[c]

Notes:

a Sufficient numbers of personnel and equipment will be determined by the Chemical Operations Chief or designee based on operational experience. For open door operations, a minimum of 2 certified operators and 2 fully functional RTAPs are required.

b Operational instruments are those that are in the field, online, and are necessary to support daily operations. For open door operations, a minimum of 2 fully functional RTAPs (minimum of 2 MINICAMS with support equipment) are required.

c Support equipment includes vacuum pumps, support gas generators, real-time analytical platforms (RTAPs), etc.

9.4 Confirmation Monitoring

Confirmation samples shall have priority over routine samples.

The proponent of this regulation is the Chief, Chemical Operations Division, Pueblo Chemical Depot. Users are invited to send comments and suggested improvements to Chief, Chemical Operations Division, Office, ATTN: CMPC-MOD-CD, 45825 Highway 96 East, Pueblo, CO 81006

OFFICIAL:

MICHAEL S. QUINN
LTC, CM
Commanding

APPENDIX A
ACRONYMS/ABBREVIATIONS

AEL	airborne exposure limit
APF	air protection factor
AR	Army Regulation
CAI	Chemical Accident/Incident
CDC	Centers for Disease Control and Prevention
CDPHE HMWMD	Colorado Department of Public Health and Environment Hazardous Materials and Waste Management Division
CFM	cubic feet per minute
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CMA	Chemical Materials Activity
DA	Department of the Army
DAAMS	Depot Area Air Monitoring System
DOT	Department of Transportation
FPD	flame photometric detector
FR	Federal Register
GC	gas chromatograph
GPL	general population limits
IAW	in accordance with
HD	distilled mustard
HEPA	high efficiency particulate air
HT	mustard-T mixture
HTL	heat traced line
HVAC	heating, ventilation, and air conditioning
IDLH	immediately dangerous to life and health
IMA	Installation Medical Authority
LCO	limiting condition of operation
LMQAP	Laboratory and Monitoring Quality Assurance Plan
MAV	Modified Ammunition Van
MCP	Monitoring Concept Plan
mg/m^3	milligrams per cubic meter
MHE	material handling equipment
mm	millimeter
MPDS	Mobile Personnel Decontamination Station
NO_x	nitrogen oxides
NRT	near real-time
O&M	operations and maintenance

APPENDIX A

OSHA	Occupational Safety Health Administration
Pam	pamphlet
PAO	Public Affairs Office
PCD	Pueblo Chemical Depot
PCE	protective clothing and equipment
PCT	preconcentrator tube
PEL	permissible exposure limit
POC	point of contact
QA	quality assurance
QA/QC	quality assurance/quality control
QASAS	Quality Assurance Specialist Ammunition Surveillance
QP	quality plant
RL	reportable limit
RMD	Risk Management Directorate
RTAP	real-time analytical platform
SCBA	self-contained breathing apparatus
SOH	Safety and Occupational Health
SOP	Standing Operating Procedure
SSLQCP	Site-Specific Laboratory Quality Control Plan
SSEMP	System Safety Engineering Management Plan
SSMP	Site-Specific Monitoring Plan
STEL	short-term exposure limit
TAP	toxicological agent protective
TCM	toxic chemical munitions
TCMF	Toxic Chemical Maintenance Facility
TMDE	Test Measurement and Diagnostic Equipment
TWA	time-weighted average
UPS	uninterruptible power supply
USAPHC	U.S. Army Public Health Command
VCC	vapor containment chamber
VSL	vapor screening limit
WPL	worker population limit

APPENDIX B
GLOSSARY OF TERMS

ADMINISTRATIVE CONTROL: Policies and procedures used to limit access and/or to reduce chemical exposures.

AGENT OPERATION: Any operation that involves chemical agent, including storage, shipping, handling, manufacturing, maintenance, test chamber activities, laboratory/ monitoring group activities, surveillance, demilitarization, decontamination, disposal, and training.

AIRBORNE EXPOSURE LIMITS: Allowable concentrations in the air for workplace and general population exposures. AELs include worker population limits (WPLs), short-term exposure limits (STELs), immediately dangerous to life or health values (IDLHs), and general population limits (GPLs).

ALARM LEVEL: A predetermined value for near real-time (NRT) monitors, that when equaled to or exceeded, will generate an alarm condition. It is a recordable value that requires a facility to take action. For methods that demonstrate the ability to detect the analyte with ±25 percent accuracy 95 percent of the time, the alarm level may be the monitoring level. When this criterion cannot be satisfied, the alarm should be a value lower than the monitoring level.

BLISTER AGENT: Chemical agent that injures the eyes and lungs, and burns or blisters the skin.

CHALLENGE: An injection of a known standard at a required monitoring level to validate that the instrument is still in control and that the calibration is valid.

CONFIRMATION: The process of validating or invalidating a positive response.

CORRECTIVE ACTION: Any action taken to rectify adverse conditions, and where possible, to preclude their recurrence.

DECONTAMINATION: The process of making any person, object, or area safe by absorbing, destroying, neutralizing, making harmless, or removing the chemical agent on that person, object, or area. Physical or chemical means to remove, deactivate, or destroy chemical agents in the surface and in the matrix of protective clothing, object or equipment.

ENGINEERING CONTROLS, PRIMARY: The device, room, or structure immediately surrounding the agent source that provides the primary protection to the workers from the chemical agent hazard, and is under negative pressure relative to the location of unprotected workers. Examples of primary controls are hoods, glove boxes, or rooms under negative pressure relative to the adjacent vestibule, corridor, or room. The chemical agent container (for example, projectile shell, rocket-casing) is considered as a primary engineering control.

ENGINEERING CONTROLS, SECONDARY: The area containing or adjacent to the primary engineering control that will prevent the further release or migration of chemical agent (to adjacent areas or the environment) if released from primary control. Examples of secondary controls are the lab room in which a hood/glove box is located or a corridor/observation vestibule adjacent to an agent storage/operations room. This includes closed system (filtered bunkers, filtered igloos, over-pack containers, on site containers, demilitarization operating

facilities and outdoor glove box operations) designed to protect unprotected workers or the ambient environment.

EXCLUSION AREA: The area immediately surrounding one or more receptacles in which chemical agents are contained. In the absence of positive preventive measures, access into the Exclusion Area constitutes access to the chemical agent.

HAZARDOUS WASTE: A solid waste as defined in 40 Code of Federal Regulations (CFR) 261.2 is a hazardous waste if it is not excluded from regulation as a hazardous waste under 40 CFR 261.4(b) and it meets any of the criteria listed in 40 CFR 261.3(a)(2)i through v.

HD: Distilled mustard, or bis(2-chloroethyl) sulfide, CAS number 505-60-2. HD is H that has been purified by washing and vacuum distillation to reduce sulfur impurities. HD is a vesicant (blister agent) and alkylating agent, producing cytotoxic action on the hematopoietic (blood-forming) tissues. The rate of detoxification of HD in the body is very slow, and repeated exposures produce a cumulative effect. Its toxic hazard is high for inhalation, ingestion, and skin and eye absorption, but the most common acute hazard is from liquid contact with eyes or skin.

HT: A lethal vesicant composed of approximately 60 percent HD [bis(2-chloroethyl) sulfide] and 40 percent agent T {bis[2-(2-chloroethylthio)ethyl]ether}. Both HD and T are alkylating agents. HT is monitored as HD. It is expected that the effects of HT would encompass those of both HD and T.

IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH): An atmosphere that poses an immediate threat to life would cause irreversible adverse health effects or would impair an individual's ability to escape from a dangerous atmosphere, regardless of PCE use. IDLH also includes atmospheres where oxygen content by volume is less than 19.5 percent.

LIMITING CONDITIONS OF OPERATIONS: Specific monitoring and laboratory conditions that must be in place before site operations are permitted to proceed.

MONITORING: The continued or periodic act of seeking to determine whether a chemical materiel is present.

MONITORING LEVEL: The level to which monitoring is performed. Responses at or above the monitoring level indicate the monitoring level has been met or exceeded, and corrective actions are required. For waste screening purposes, the monitoring level is the negotiated treatment value for a specific analyte within a specific matrix.

MONITORING PLAN: A detailed, site-specific plan that covers all laboratory and monitoring objectives and strategies for a given site. The plan describes methods and equipment used, locations, number and type of samples, safety requirements, transportation and shipping instructions, scheduling, and any other site-related monitoring requirements.

PERMISSIBLE or PUBLISHED EXPOSURE LIMIT (PEL): The exposure, inhalation, or dermal PEL specified in 29 CFR Part 1910, Subparts G and Z.

PROCESS AREA: An area where chemical agent contamination in the form of vapor or liquid/vapor, is expected to be present (storage structure containing leaking toxic chemical munitions [TCM]).

APPENDIX B

REPORTABLE LIMIT: A predetermined value for historical method that, when equaled or exceeded, will be reported as chemical materiel that may have exceeded the monitoring level.

SHORT-TERM EXPOSURE LIMIT (STEL): The maximum concentration to which unprotected chemical workers may be exposed for up to 15 minutes continuously.

STANDARD: A known concentration of a known chemical that is used to perform quantitative analysis.

STANDING OPERATING PROCEDURE (SOP): A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps, and that is officially approved as the method for performing certain routine or repetitive tasks.

TIME-WEIGHTED AVERAGE (TWA): A maximum level or concentration of a chemical agent, averaged over a specified period of time to which employees may be exposed.

VAPOR SCREENING LEVEL (VSL): The level to which an item is monitored to determine the level of cleanliness. Typically done by containing the item in an enclosed space to limit incoming dilution. See DA-PAM 385-61.

WORKSPACE PROCESS AREA: An area where single-contained TCM is present and personnel perform work on a routine basis. Chemical agent contamination is not expected, but because of the nature of the operations being performed in these areas, there is a potential for contamination (that is, igloo).

WORKER POPULATION LIMIT (WPL): Maximum allowable 8-hour TWA concentration that an unmasked worker could be exposed to for an 8-hour workday and 40 hours per week for 30 years without adverse effect. WPL values are identified in Section 3.

APPENDIX C
REFERENCES

Army Regulation (AR) 385-10, *Army Safety Program.*

Centers for Disease Control (CDC) and Prevention Memorandum, dated 24 March 2005 (Response to DA Memorandum, dated 8 March 2005).

Code of Federal Regulations (CFR), Title 29, Part 1910.120, *OSHA Hazardous Waste Operations and Emergency Response.*

CFR, Title 40, Environmental Protection Agency, Protection of the Environment, Part 136, Appendix B, *Definition and Procedure for the Determination of the Method Detection Limit*, Revision 1.11.

CFR, Title 40, Environmental Protection Agency, Protection of the Environment, Part 261, Appendix VIII, *Hazardous Constituents.*

CFR, Title 40, Environmental Protection Agency, Protection of the Environment, Part 261, Section 24, *Toxicity Characteristics.*

Department of the Army (DA), Army Regulation (AR) 50-6, *Nuclear and Chemical Weapons and Materiel, Chemical Surety.*

DA, Memorandum, DACS-SF, SUBJECT: *Breathing Zone Monitoring of Chemical Agent Workers*, dated 18 November 1999. (Update to: DA, Memorandum DACS-SF, Subject: *Chemical Agent Policy Issues*, 13 January 1992.)

DA, Memorandum, CMA Risk Management Directorate, dated 8 March 2005 (Centers for Disease Control and Prevention—WPL implementation and duration adjustment)

DA, Pamphlet (Pam) 40-173, *Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT.*

DA, Pam 385-61, *Toxic Chemical Agent Safety Standards.*

DA, Pamphlet 385-30, Mishap Risk Management

DA, Supply Bulletin 742-1, *Ammunition Surveillance Procedures, Inspection of Supplies and Equipment.*

68 Federal Register (FR) 34036-34119, *OSHA Assigned Protection Factors*

69 FR 24164-24168, *CDC Interim Recommendations for Airborne Exposure Limits for Chemical Warfare Agents H and HD (Sulfur Mustard)*

MCHB-IP-OFS, Subject: *Industrial Hygiene Field Services Report No. S.0009854, Bunker Ventilation Study Using Tracer Gas, Pueblo Chemical Depot, Pueblo, Colorado,* 16 April 2010 – 16 February 2012.

APPENDIX C

MCXE-PMA-PHC, Subject: *A Study of Factors Influencing the Movement of HD/HT Vapors Released Inside a Chemical Munitions Storage Igloo*, 16 December 1996.

PCD, *Pueblo Chemical Depot Site Specific Laboratory Quality Control Plan.*

PCD, *System Safety Engineering Management Plan*

PCD Regulation 50-4, *Equipment Decontamination Plan.*

PCD, Standing Operating Procedure (SOP) PU-0000-R-491, *Near Real Time Monitoring Systems: Technical Operating Procedures.*

PCD SOP PU-0000-T-486, *Chemical Operations.*

PCD SOP PU-0000-W-465, *Toxic Chemical Laboratory Analytical Operating Procedures.*

PCD SOP PU-0000-M-302, *Use of Emergency Response Equipment.*

PCD SOP PU-0000-R-468, *Propellant Stability Sampling*

U.S. Army Chemical Materials Agency, *Programmatic Laboratory and Monitoring Quality Assurance Plan.*

U.S. Army Chemical Materials Agency, *Programmatic Monitoring Concept Plan*

APPENDIX D
AGENT MONITORS AND METHODS

Monitoring systems utilized during Pueblo Chemical Depot (PCD) operations include the following:

a. *Sorbent Tubes.* Sorbent tubes are glass tubes filled with a collection material (for example Tenax® GC). As the air is passed through the solid sorbent tube, agent is collected. After sampling for the predetermined period of time and flow rate, the tube is removed from the vacuum line and sent to a chemical laboratory for analysis to determine the presence, type, and quantity of agent collected. This technique will provide low-level detection capability for sarin (GB), H-series, and O-ethyl S-(2-diisopropylaminoethyl)methylphosphonothioate (VX).

b. *MINICAMS®.* MINICAMS® is an automated gas chromatograph that is currently available for near real-time agent detection capability. The system collects compounds present in the air on a solid sorbent tube, thermally desorbs them into a capillary column for separation, and detects the compound with a flame photometric detector.

c. *Visual Inspection.* A thorough visual inspection of accessible agent-filled munitions items and containers is a necessary and useful adjunct for detecting leaking agent. Special attention should be given to any wet or damp areas and painted surfaces since agent may cause blistering or peeling and discoloration of painted surfaces. All suspect liquids observed during the inspection should be tested with the M8 detector paper as a confirmatory measure. Agent leakage sometimes occurs at the juncture between the fuze or closing plug and projectile and then, due to chemical reaction and evaporation, self-sealing of the leak may result. Inspecting personnel should be aware of this condition and recognize that any built up area between the fuze or closing plug and projectile, or presence of a dry residue, may be an indication of agent leakage.

d. *Sampling Flowmeters.* Flowmeters used during sampling operations will be annually calibrated and capable of measuring the required air flow to operate approved sampling tubes or media.

e. *Real-Time Analytical Platform (RTAP).* The RTAP is equipped with a minimum of two MINICAMS®. Additionally the RTAP may be equipped with a DAAMS station. The RTAP is especially useful in onsite clearance of igloos and other suspect agent contamination sites. The RTAP provides mobility and environmental protection for the NRT monitoring system MINICAMS® and DAAMS station. The RTAPs use HTLs for remote monitoring.

f. Monitoring with additional sample lines, gross-level detectors, etc. will be performed using 1/4-inch internal diameter unheated Teflon lines.

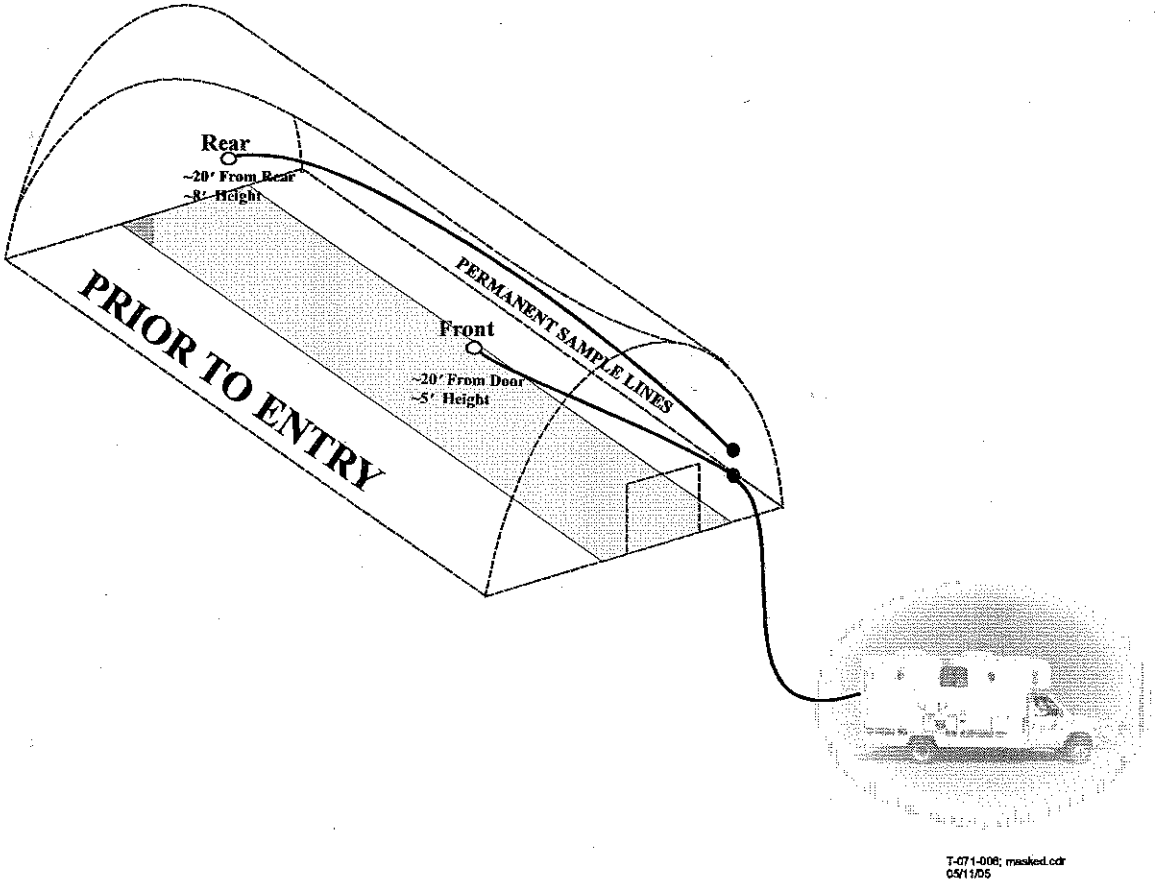
g. Sample lines must be dust and dirt free and will be purged with nitrogen gas or air, as needed.

h. All sampling lines, connectors, or other surfaces that might contact chemical agents before introduction into the sampling device (that is, Depot Area Air Monitoring System [DAAMS], etc.) should be made from Teflon or stainless steel.

APPENDIX E
MONITORING OPERATION DIAGRAM

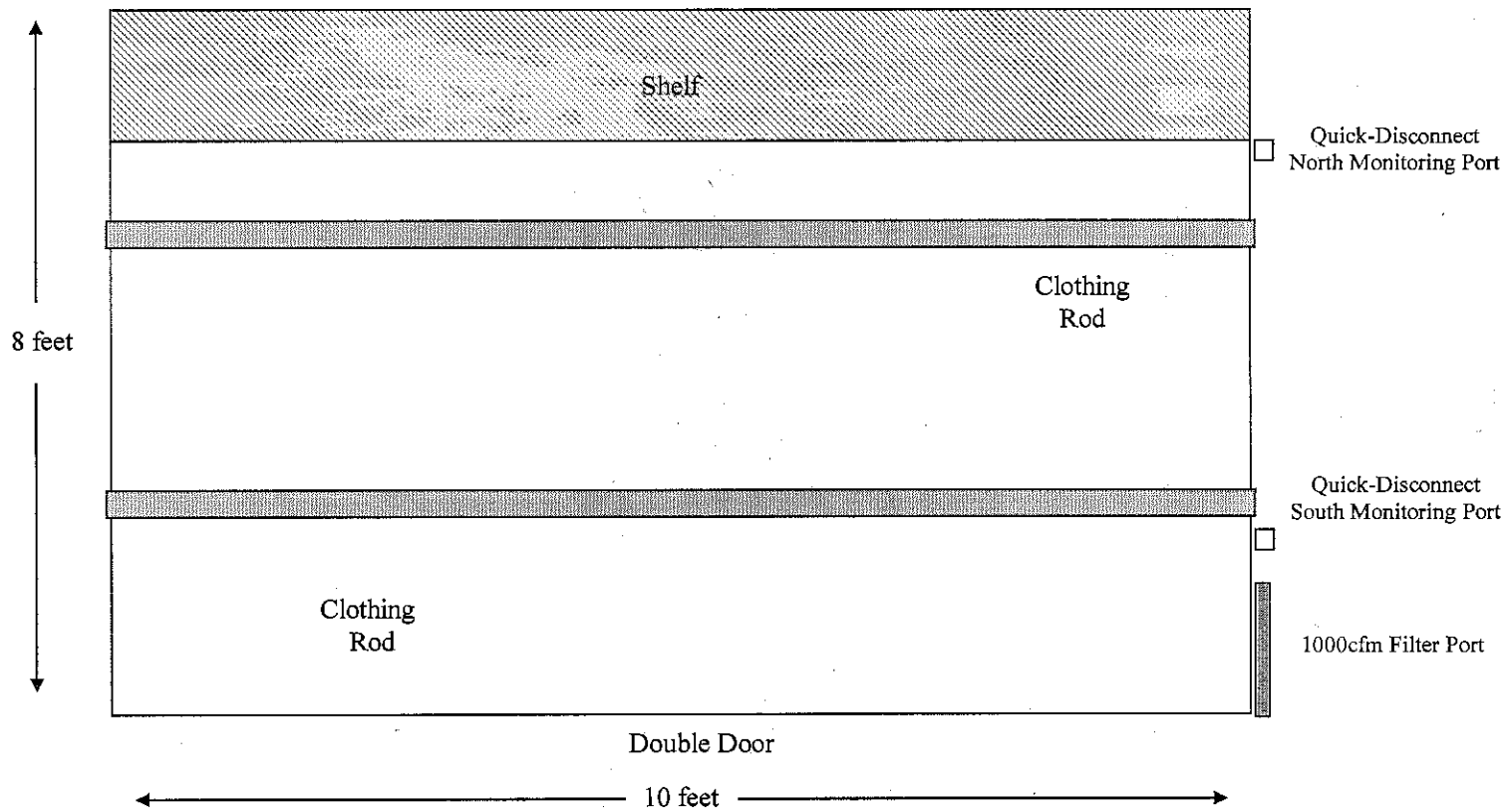
MASKED/UNMASKED OPERATIONS

MASKED OPERATIONS



APPENDIX F
DRAWINGS AND AIR FLOW PATTERNS

MONITORING ROOM
Building 475



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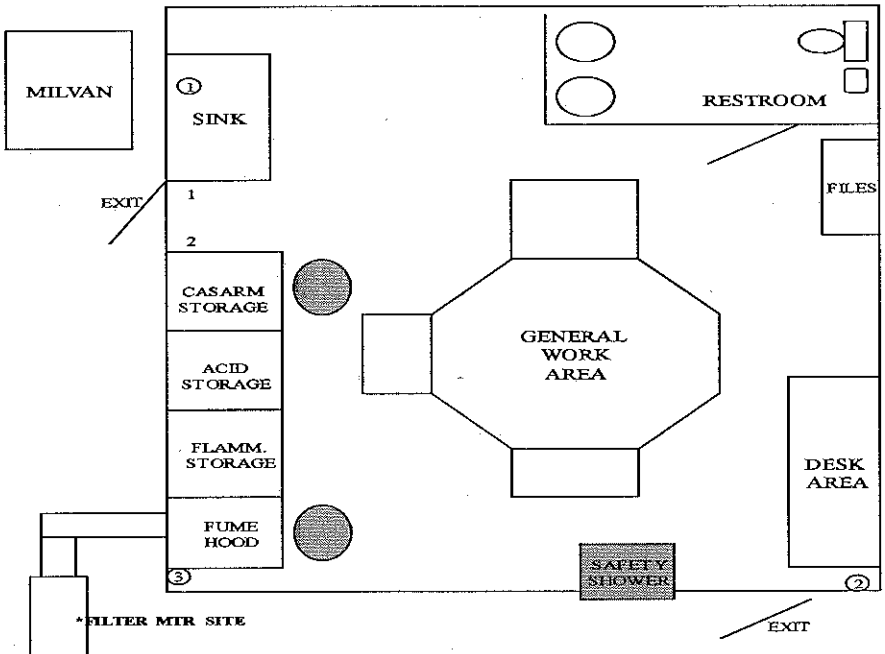
APPENDIX F

CHEMICAL LABORATORY

BUILDING 487

CHEMICAL LABORATORY
Building 487

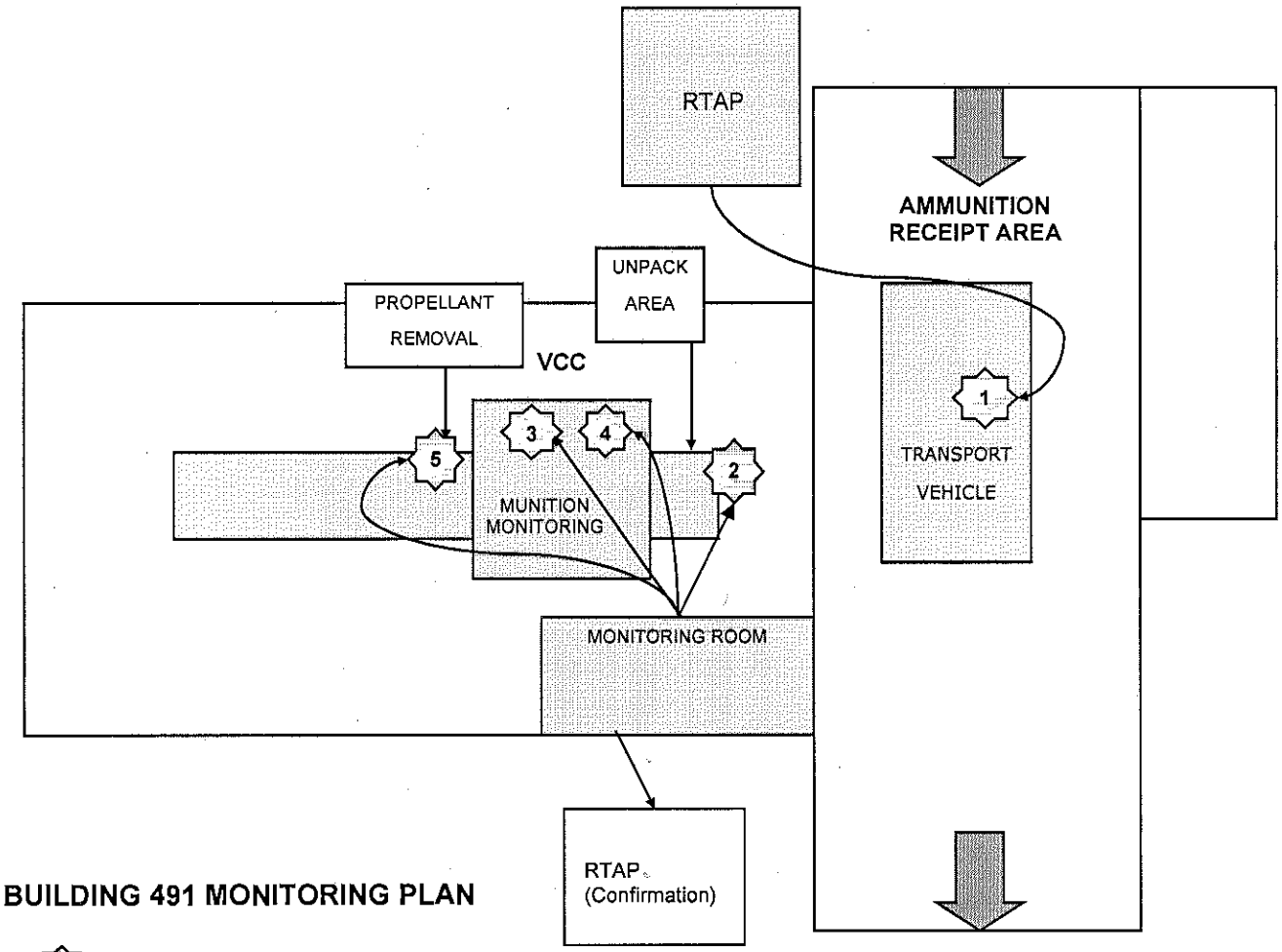


Ventilation System in Lab
Exterior Walls & Roof Sheet Metal
Floor: Tile w/Epiloid G in Spill Areas (Highlighted)
Liquid/Solid SAP

1 Fire Extinguisher
2 Fire Extinguisher
3 Spill Kit

APPENDIX F

MONITORING STATIONS, BUILDING 491



BUILDING 491 MONITORING PLAN

This symbol denotes a monitoring point

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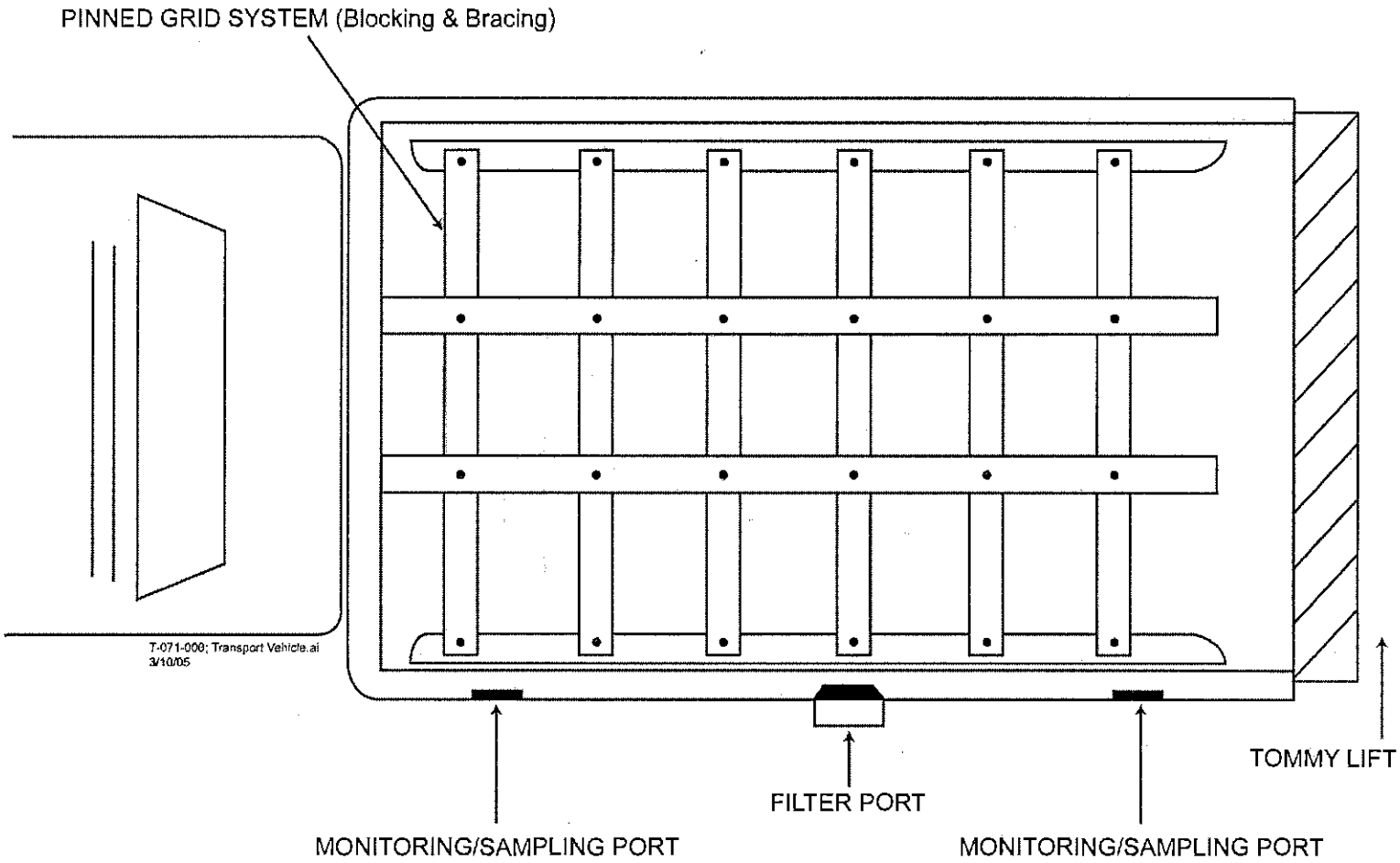
APPENDIX F

TRANSPORT VEHICLE CUT-AWAY (TOP VIEW)



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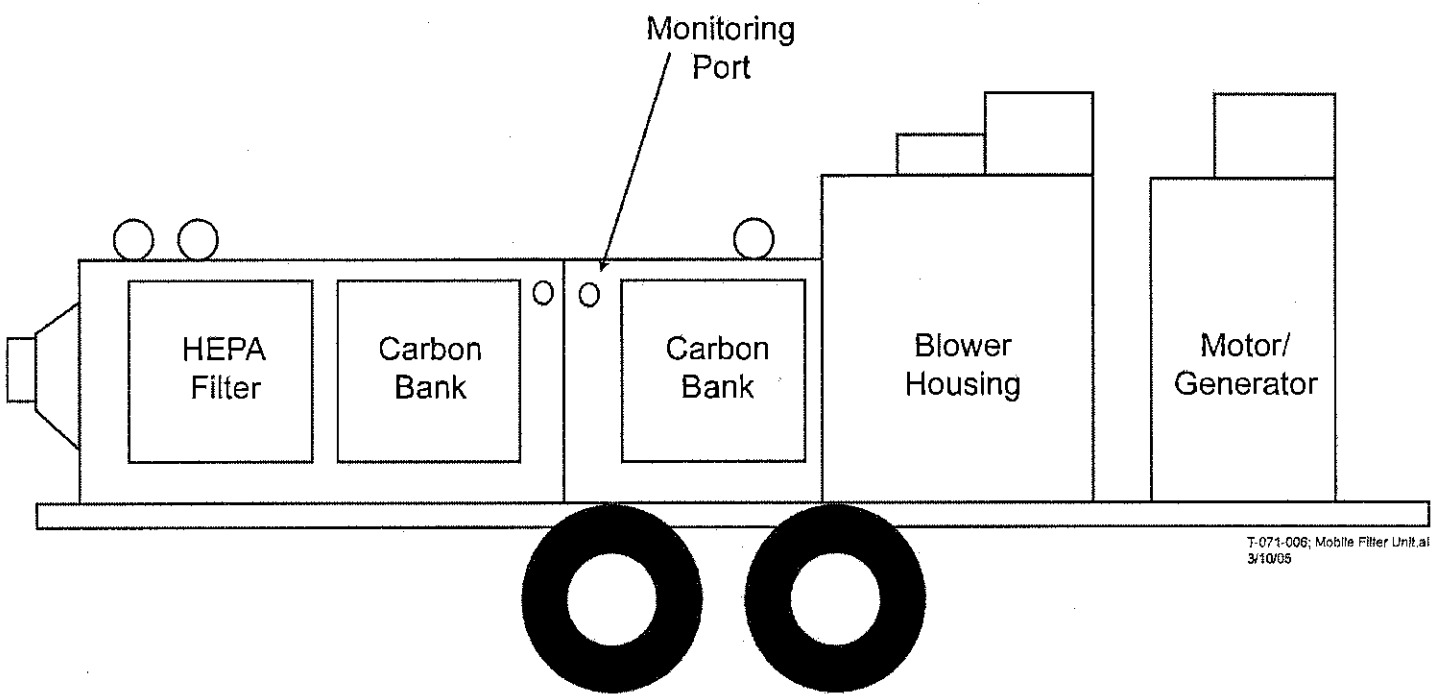
APPENDIX F

1,000 CFM MOBILE FILTER UNIT



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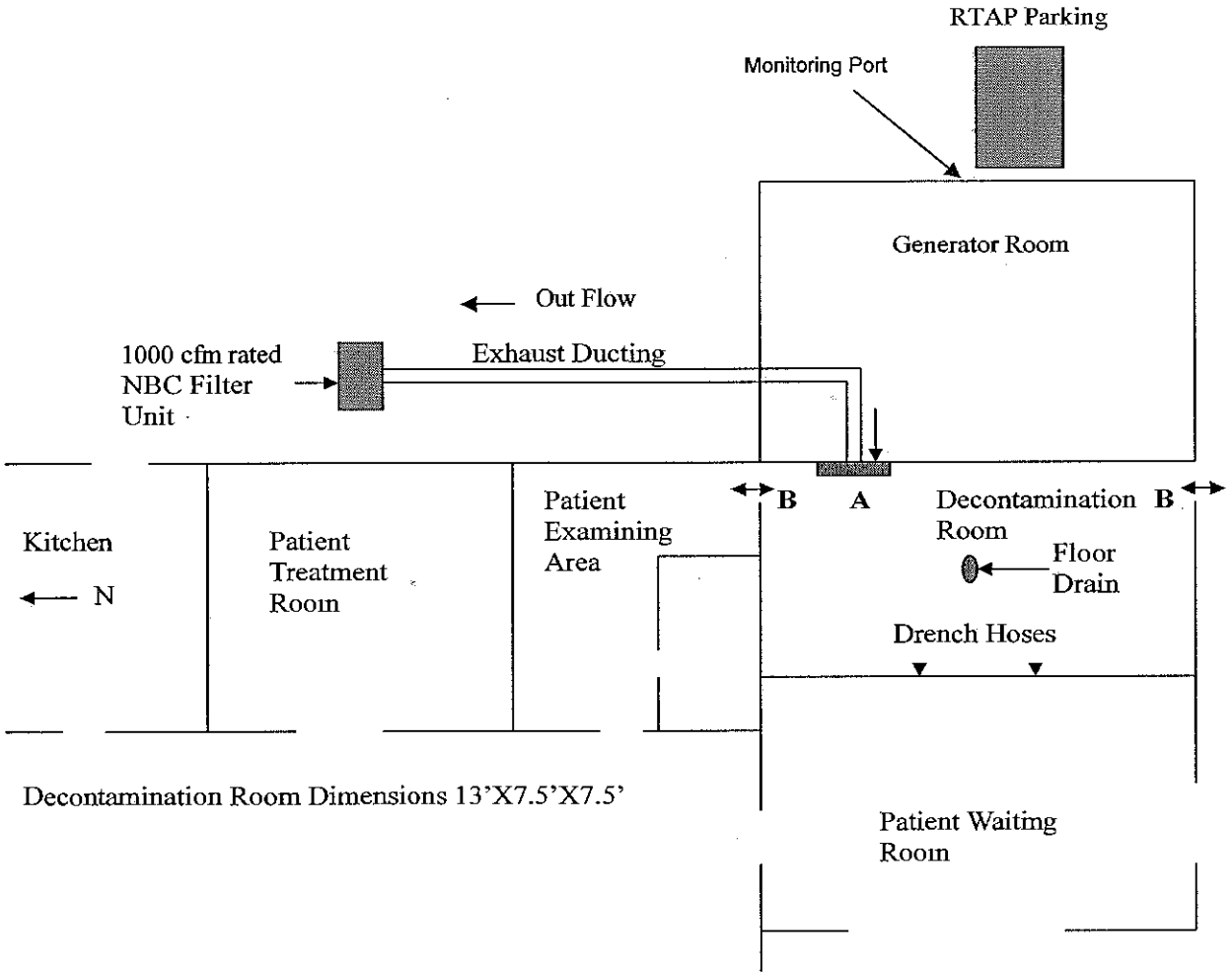
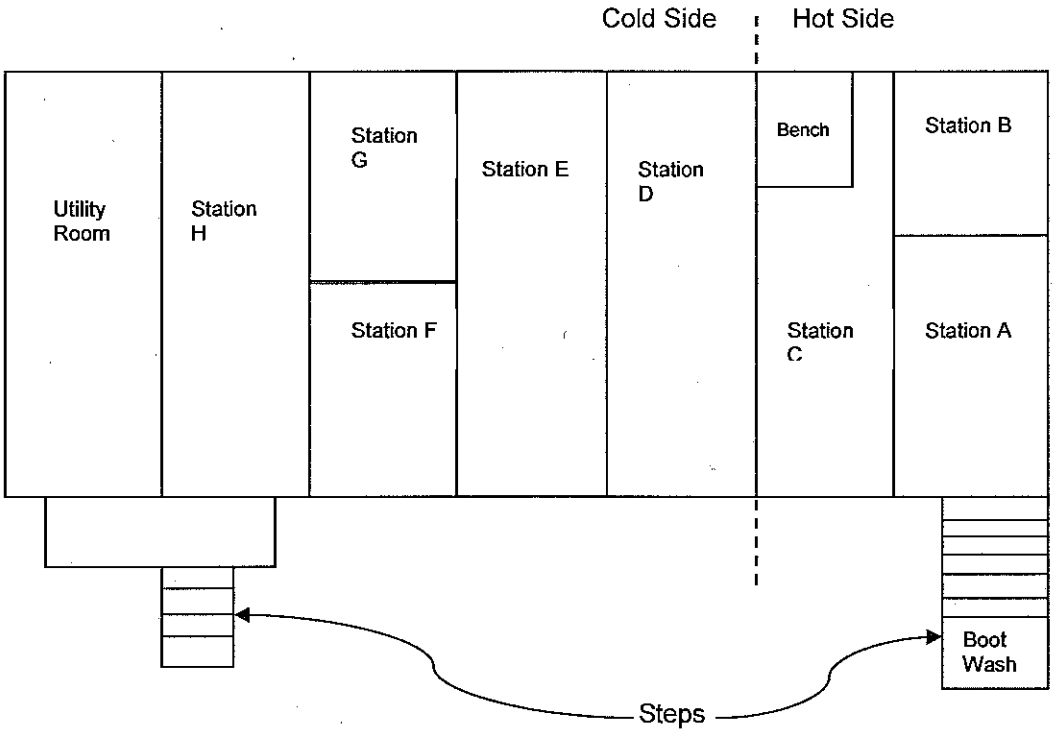
APPENDIX F

Occupational Health Clinic (OHC) Vestibule (Decontamination Room)



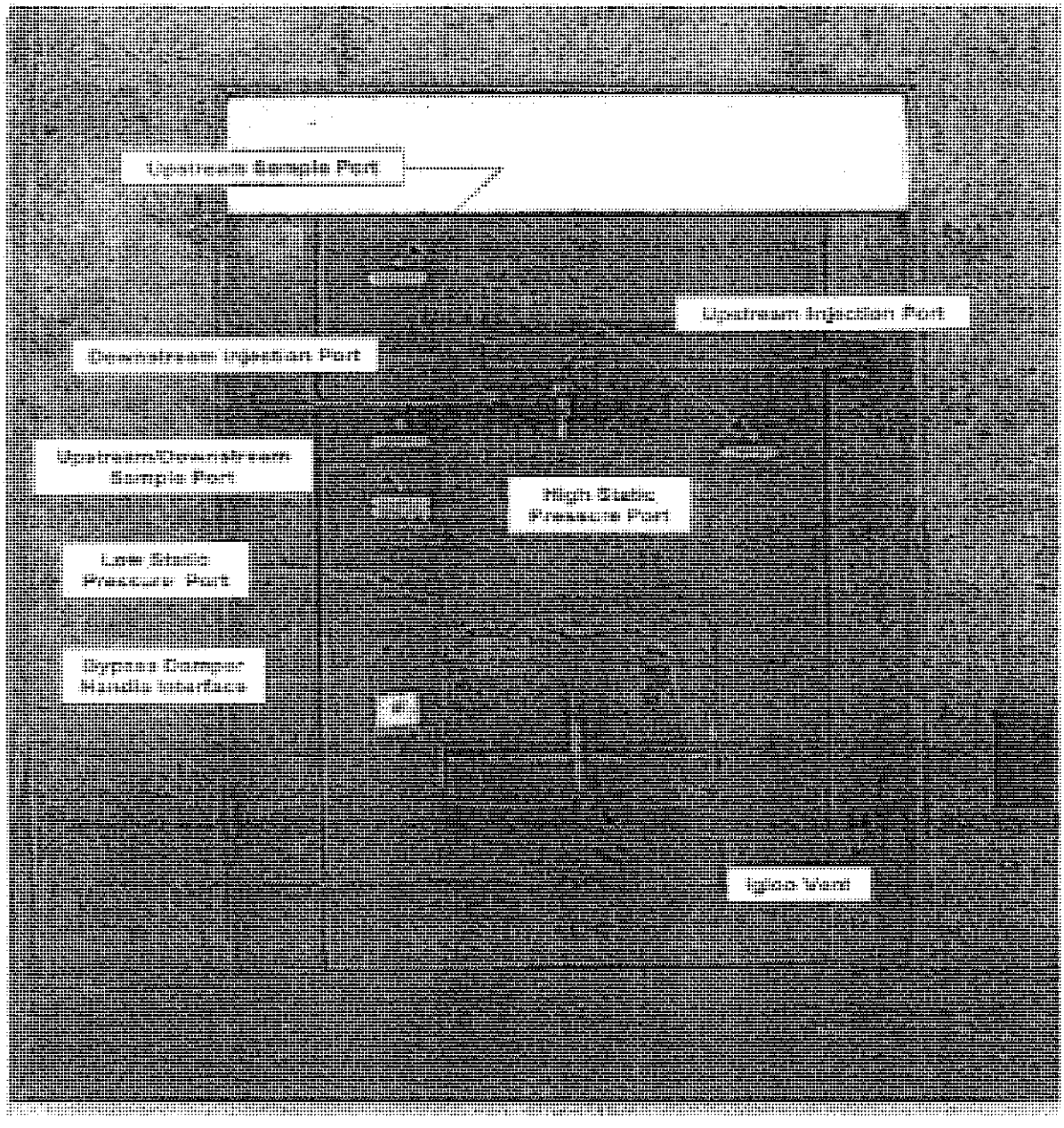
APPENDIX F

Line Layout for MPDS Trailer



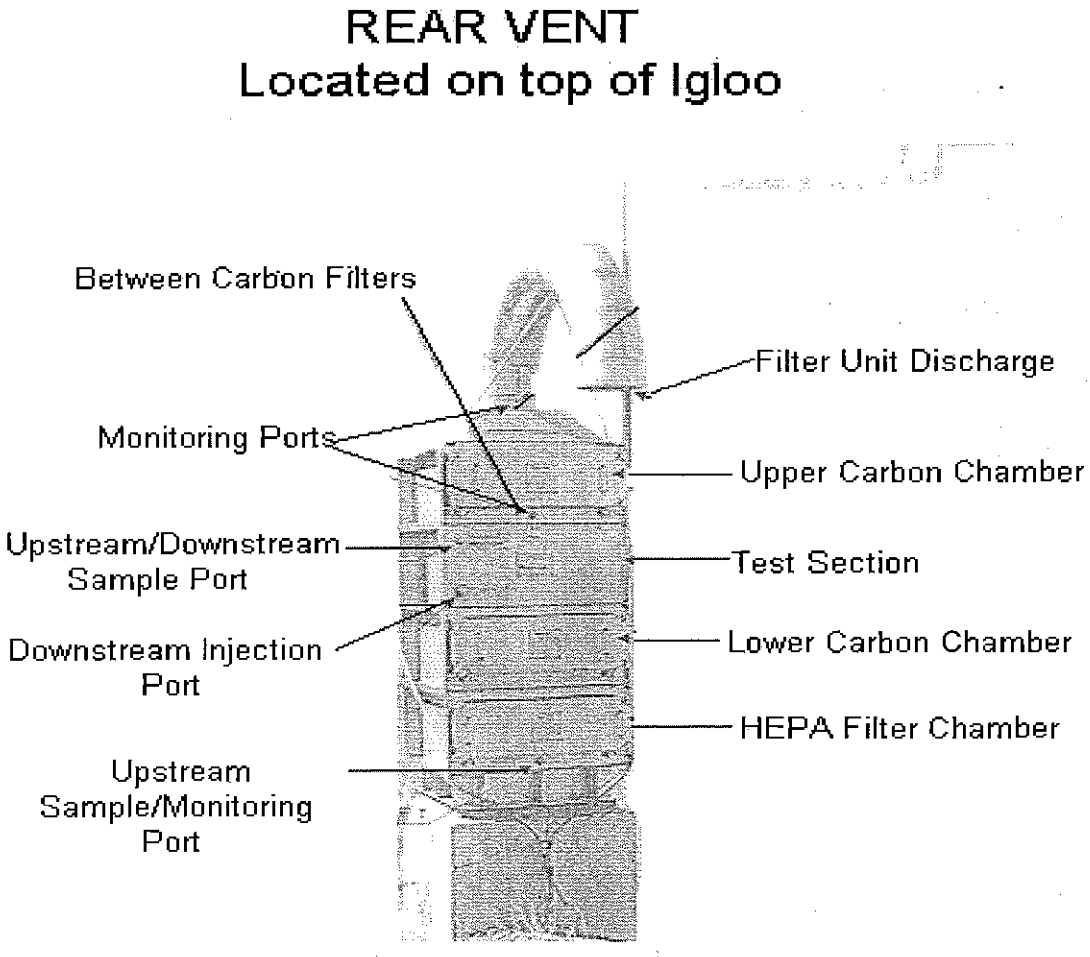
APPENDIX F

Passive Filter Front Vent Monitoring Diagram



APPENDIX F

Passive Filter Rear Vent Monitoring Diagram



APPENDIX G

INDUSTRIAL HYGIENE EVALUATION OF WPL MONITORING

MUSTARD AGENT (HD/HT) OPERATION	LOCATION	HISTORICAL BASELINE	ENGINEERING CONTROLS	OTHER CONTROLS	RELIABILITY OF CONTROLS	PCE (OSHA LEVEL OF DRESS)	RESPIRATORY PROTECTION	ASSIGNED PROTECTION FACTORS/MAXIMUM USE CONCENTRATIONS APF/MUC-WPL	DAILY OPERATION FREQUENCY	OPERATION DURATION IN MINUTES	DAILY EXPOSURE DURATION (DED) IN MINUTES (FREQUENCY x DURATION)	MONITORING EQUIPMENT*	MONITORING FEREQUENCY	HD/HT WPL EXPOSURE LIMIT 8 HR TWA	AIR MONITORING LEVEL CONCENTRATION (DED X MONITORING LEVEL CANNOT EXCEED 0.192 MG/MIN/M^3)
Reference: DA Pam 385-61 (3-4)(e) [SUPERCEDES U.S. ARMY IMPLEMENTATION GUIDANCE POLICY FOR REVISED AIRBORNE EXPOSURE LIMITS, 18 JUNE 2004, APPENDIX B (6)(e)]															
	3-4e(2)(e) 3-4 e(2)(f)	3-4e(2)a)	3-4e(2)(c)	3-4e(2)(c) 3-4e(2)(d)	3-4e(2)(m) 3-4e(2)(n)	3-4e(2)(b)	3-4e(2)b)	3-4e(2)	3-4e(2)(h) 3-4e(2)(g))	3-4e(2)(h) 3-4e(2)(i)	3-4e(2)(i)	3-4e(2)(k)			
UNCONTROLLED															UNCONTROLLED
FIRST ENTRY MONITORING	INSIDE ALL IGLOOS	HISTORICAL MONITORING DATA RETAINED AT PCD	CONTAINMENT STRUCTURE (IGLOO), SUPPLEMENTAL LIGHTING	PROTECTIVE CLOTHING AND EQUIPMENT (PCE), LOW LEVEL AIR MONITORING, TRAINING, VISUAL INSPECTION, EYEWASH AND SHOWER FACILITIES, HYDRATION FLUIDS, DECONTAMINATION SOLUTIONS/EQUIPMENT WITH CATCH BASINS, BACKUP POWER, BACKUP VENTILATION SYSTEMS, MEDICAL SURVEILLANCE AND MONITORING, EMERGENCY MEDICAL RESPONSE, ACCESS CONTROL SIGNS/BARRIERS, STANDARD OPERATING PROCEDURES, RADIO COMMUNICATIONS SYSTEMS	PCE INSPECTION, TESTING AND REPAIR PROGRAM; VENTILATION INSPECTION, TESTING AND REPAIR PROGRAMS; EQUIPMENT INSPECTION, TESTING, AND REPAIR PROGRAMS; DEPOT TRAINING PLANS AND CERTIFICATION PROCESSES; HEAT/COLD STRESS PREVENTION PROGRAM; DOCUMENT REVIEW AND UPDATING PROCESS, DECONTAMINANT QUALITY TESTING PROGRAM, ARMY OCCUPATIONAL SAFETY AND HEALTH INSPECTIONS,	OSHA LEVEL D	M40A1 (WORN)	50/0.02 MG/M^3 (NOT TO EXCEED 0.7 MG/MIN/M^3 PER DAY)	15	10	150	MINICAMS**	CONTINUOUS	0.0004 MG/M^3	0.0008 MG/M^3

APPENDIX G

MUSTARD AGENT (HD/HT) OPERATION	LOCATION	HISTORICAL BASELINE	ENGINEERING CONTROLS	OTHER CONTROLS	RELIABILITY OF CONTROLS	PCE (OSHA LEVEL OF DRESS)	RESPIRATORY PROTECTION	ASSIGNED PROTECTION FACTORS/MAXIMUM USE CONCENTRATIONS APF/MUC-WPL	DAILY OPERATION FREQUENCY	OPERATION DURATION IN MINUTES	DAILY EXPOSURE DURATION (DED) IN MINUTES (FREQUENCY x DURATION)	MONITORING EQUIPMENT*	MONITORING FEREQUENCY	HD/HT WPL EXPOSURE LIMIT 8 HR TWA	AIR MONITORING LEVEL CONCENTRATION (DED X MONITORING LEVEL CANNOT EXCEED 0.192 MG/MIN/M^3)
Reference: DA Pam 385-61 (3-4)(e) [SUPERCEDES U.S. ARMY IMPLEMENTATION GUIDANCE POLICY FOR REVISED AIRBORNE EXPOSURE LIMITS, 18 JUNE 2004, APPENDIX B (6)(e)]															
	3-4e(2)(e) 3-4 e(2)(f)	3-4e(2)a)	3-4e(2)(c)	3-4e(2)(c) 3-4e(2)(d)	3-4e(2)(m) 3-4e(2)(n)	3-4e(2)(b)	3-4e(2)b)	3-4e(2)	3-4e(2)(h) 3-4e(2)(g))	3-4e(2)(h) 3-4e(2)(l)	3-4e(2)(l)	3-4e(2)(k)			
UNCONTROLLED					AMMUNITION QUALITY CONTROL INSPECTIONS										UNCONTROLLED
STORAGE MONITORING INSPECTION	INSIDE ALL IGLOOS	HISTORICAL MONITORING DATA RETAINED AT PCD	CONTAINMENT STRUCTURE (IGLOO), SUPPLEMENTAL LIGHTING	PROTECTIVE CLOTHING AND EQUIPMENT (PCE), LOW LEVEL AIR MONITORING, TRAINING, VISUAL INSPECTION, EYEWASH AND SHOWER FACILITIES, HYDRATION FLUIDS, DECONTAMINATION SOLUTIONS/EQUIPMENT WITH CATCH BASINS, BACKUP POWER, BACKUP VENTILATION SYSTEMS, MEDICAL SURVEILLANCE AND MONITORING, EMERGENCY MEDICAL RESPONSE, ACCESS CONTROL SIGNS/BARRIERS, STANDARD OPERATING PROCEDURES, RADIO COMMUNICATIONS SYSTEMS	PCE INSPECTION, TESTING AND REPAIR PROGRAM; VENTILATION INSPECTION, TESTING AND REPAIR PROGRAMS; EQUIPMENT INSPECTION, TESTING, AND REPAIR PROGRAMS; DEPOT TRAINING PLANS AND CERTIFICATION PROCESSES; HEAT/COLD STRESS PREVENTION PROGRAM; DOCUMENT REVIEW AND UPDATING PROCESS, DECONTAMINANT QUALITY TESTING PROGRAM	OSHA LEVEL D	M40A1 (SLUNG)	50/0.02 MG/M^3 (NOT TO EXCEED 0.7 MG/MIN/M^3 PER DAY)	15	10	150	MINICAMS	CONTINUOUS	0.0004 MG/M^3	0.0008 MG/M^3

MUSTARD AGENT (HD/HT) OPERATION	LOCATION	HISTORICAL BASELINE	ENGINEERING CONTROLS	OTHER CONTROLS	RELIABILITY OF CONTROLS	PCE (OSHA LEVEL OF DRESS)	RESPIRATORY PROTECTION	ASSIGNED PROTECTION FACTORS/MAXIMUM USE CONCENTRATIONS APF/MUC-WPL	DAILY OPERATION FREQUENCY	OPERATION DURATION IN MINUTES	DAILY EXPOSURE DURATION (DED) IN MINUTES (FREQUENCY x DURATION)	MONITORING EQUIPMENT*	MONITORING FEREQUENCY	HD/HT WPL EXPOSURE LIMIT 8 HR TWA	AIR MONITORING LEVEL CONCENTRATION (DED X MONITORING LEVEL CANNOT EXCEED 0.192 MG/MIN/M^3)
Reference: DA Pam 385-61 (3-4)(e) [SUPERCEDES U.S. ARMY IMPLEMENTATION GUIDANCE POLICY FOR REVISED AIRBORNE EXPOSURE LIMITS, 18 JUNE 2004, APPENDIX B (6)(e)]															
	3-4e(2)(e) 3-4 e(2)(f)	3-4e(2)a)	3-4e(2)(c)	3-4e(2)(c) 3-4e(2)(d)	3-4e(2)(m) 3-4e(2)(n)	3-4e(2)(b)	3-4e(2)b)	3-4e(2)	3-4e(2)(h) 3-4e(2)(g))	3-4e(2)(h) 3-4e(2)(l)	3-4e(2)(l)	3-4e(2)(k)			
MAGAZINE INSPECTION	INSIDE ALL IGLOOS	HISTORICAL MONITORING DATA RETAINED AT PCD	CONTAINMENT STRUCTURE (IGLOO), SUPPLEMENTAL LIGHTING	PROTECTIVE CLOTHING AND EQUIPMENT (PCE), LOW LEVEL AIR MONITORING, TRAINING, VISUAL INSPECTION, EYEWASH AND SHOWER FACILITIES, HYDRATION FLUIDS, DECONTAMINATION SOLUTIONS WITH CATCH BASINS, BACKUP POWER, BACKUP VENTILATION SYSTEMS, MEDICAL SURVEILLANCE AND MONITORING, EMERGENCY MEDICAL RESPONSE, ACCESS CONTROL SIGNS BARRIERS, STANDARD OPERATING PROCEDURES, RADIO COMMUNICATIONS SYSTEMS	PCE INSPECTION, TESTING AND REPAIR PROGRAM; VENTILATION INSPECTION, TESTING AND REPAIR PROGRAMS; EQUIPMENT INSPECTION, TESTING, AND REPAIR PROGRAMS; DEPOT TRAINING PLANS AND CERTIFICATION PROCESSES; HEAT/COLD STRESS PREVENTION PROGRAM; DOCUMENT REVIEW AND UPDATING PROCESS, DECONTAMINANT QUALITY TESTING PROGRAM	OSHA LEVEL D	M40A1 (SLUNG)	50/0.02 MG/M^3 (NOT TO EXCEED 0.7 MG/MIN/M^3 PER DAY)	15	10	150	MINICAMS	CONTINUOUS	0.0004 MG/M^3	0.0008 MG/M^3
ANNUAL PHYSICAL INVENTORY	INSIDE ALL IGLOOS	HISTORICAL MONITORING DATA RETAINED AT PCD	CONTAINMENT STRUCTURE (IGLOO), SUPPLEMENTAL LIGHTING	PROTECTIVE CLOTHING AND EQUIPMENT (PCE), LOW LEVEL AIR MONITORING, TRAINING, VISUAL INSPECTION, EYEWASH AND SHOWER FACILITIES, HYDRATION FLUIDS, DECONTAMINATION SOLUTIONS/EQUIPMENT WITH CATCH BASINS, BACKUP POWER, BACKUP VENTILATION SYSTEMS, MEDICAL SURVEILLANCE AND MONITORING, EMERGENCY MEDICAL RESPONSE, ACCESS CONTROL SIGNS BARRIERS, STANDARD OPERATING PROCEDURES, RADIO COMMUNICATIONS SYSTEMS	PCE INSPECTION, TESTING AND REPAIR PROGRAM; VENTILATION INSPECTION, TESTING AND REPAIR PROGRAMS; EQUIPMENT INSPECTION, TESTING, AND REPAIR PROGRAMS; DEPOT TRAINING PLANS AND CERTIFICATION PROCESSES; HEAT/COLD STRESS PREVENTION PROGRAM; DOCUMENT REVIEW AND UPDATING PROCESS, DECONTAMINANT QUALITY TESTING PROGRAM	OSHA LEVEL D	M40A1 (SLUNG)	50/0.02 MG/M^3 (NOT TO EXCEED 0.7 MG/MIN/M^3 PER DAY)	15	10	150	MINICAMS	CONTINUOUS	0.0004 MG/M^3	0.0008 MG/M^3

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UNCONTROLLED

APPENDIX G

MUSTARD AGENT (HD/HT) OPERATION	LOCATION	HISTORICAL BASELINE	ENGINEERING CONTROLS	OTHER CONTROLS	RELIABILITY OF CONTROLS	PCE (OSHA LEVEL OF DRESS)	RESPIRATORY PROTECTION	ASSIGNED PROTECTION FACTORS/MAXIMUM USE CONCENTRATIONS APF/MUC-WPL	DAILY OPERATION FREQUENCY	OPERATION DURATION IN MINUTES	DAILY EXPOSURE DURATION (DED) IN MINUTES (FREQUENCY x DURATION)	MONITORING EQUIPMENT*	MONITORING FEREQUENCY	HD/HT WPL EXPOSURE LIMIT 8 HR TWA	AIR MONITORING LEVEL CONCENTRATION (DED X MONITORING LEVEL CANNOT EXCEED 0.192 MG/MIN/M^3)
Reference: DA Pam 385-61 (3-4)(e) [SUPERCEDES U.S. ARMY IMPLEMENTATION GUIDANCE POLICY FOR REVISED AIRBORNE EXPOSURE LIMITS, 18 JUNE 2004, APPENDIX B (6)(e)]															
	3-4e(2)(e) 3-4 e(2)(f)	3-4e(2)a)	3-4e(2)(c)	3-4e(2)(c) 3-4e(2)(d)	3-4e(2)(m) 3-4e(2)(n)	3-4e(2)(b)	3-4e(2)b)	3-4e(2)	3-4e(2)(h) 3-4e(2)(g))	3-4e(2)(h) 3-4e(2)(l)	3-4e(2)(l)	3-4e(2)(k)			
STORAGE HANDLING AND TRANSPORT PROCEDURES	ALL LOCATIONS IN G BLOCK ADJACENT TO TRANSPORT VEHICLE	HISTORICAL MONITORING DATA RETAINED AT PCD	CONTAINMENT VEHICLE (TRANSPORT VEHICLE), SUPPLEMENTAL LIGHTING	PROTECTIVE CLOTHING AND EQUIPMENT (PCE), LOW LEVEL AIR MONITORING, TRAINING, VISUAL INSPECTION, EYEWASH AND SHOWER FACILITIES, HYDRATION FLUIDS, DECONTAMINATION SOLUTIONS/EQUIPMENT WITH CATCH BASINS, BACKUP POWER, BACKUP VENTILATION SYSTEMS, MEDICAL SURVEILLANCE AND MONITORING, EMERGENCY MEDICAL RESPONSE, ACCESS CONTROL SIGNS BARRIERS, STANDARD OPERATING PROCEDURES, RADIO COMMUNICATIONS SYSTEMS	PCE INSPECTION, TESTING AND REPAIR PROGRAM; VENTILATION INSPECTION, TESTING AND REPAIR PROGRAMS; EQUIPMENT INSPECTION, TESTING, AND REPAIR PROGRAMS; DEPOT TRAINING PLANS AND CERTIFICATION PROCESSES; HEAT/COLD STRESS PREVENTION PROGRAM; DOCUMENT REVIEW AND UPDATING PROCESS, DECONTAMINANT QUALITY TESTING PROGRAM	OSHA LEVEL D	M40A1 (SLUNG)	50/0.02 MG/M^3 (NOT TO EXCEED 0.7 MG/MIN/M^3 PER DAY)	6	10	6D	MINICAMS	CONTINUOUS	0.0004 MG/M^3	0.0008 MG/M^3
INTRUSION DETECTION SYSTEM TESTING, DISTAL LINE CHALLENGE.	INSIDE ALL IGLOOS	HISTORICAL MONITORING DATA RETAINED AT PCD	CONTAINMENT STRUCTURE (IGLOO), SUPPLEMENTAL LIGHTING	PROTECTIVE CLOTHING AND EQUIPMENT (PCE), LOW LEVEL AIR MONITORING, TRAINING, VISUAL INSPECTION, EYEWASH AND SHOWER FACILITIES, HYDRATION FLUIDS, DECONTAMINATION SOLUTIONS WITH CATCH BASINS, BACKUP POWER, BACKUP VENTILATION SYSTEMS, MEDICAL SURVEILLANCE AND MONITORING, EMERGENCY MEDICAL RESPONSE, ACCESS CONTROL SIGNS/BARRIERS, STANDARD OPERATING PROCEDURES, RADIO COMMUNICATIONS SYSTEMS	PCE INSPECTION, TESTING AND REPAIR PROGRAM; VENTILATION INSPECTION, TESTING AND REPAIR PROGRAMS; EQUIPMENT INSPECTION, TESTING, AND REPAIR PROGRAMS; DEPOT TRAINING PLANS AND CERTIFICATION PROCESSES; HEAT/COLD STRESS PREVENTION PROGRAM; DOCUMENT REVIEW AND UPDATING PROCESS, DECONTAMINANT QUALITY TESTING PROGRAM	OSHA LEVEL D	M40A1 (SLUNG)	50/0.02 MG/M^3 (NOT TO EXCEED 0.7 MG/MIN/M^3 PER DAY)	20	10	200	MINICAMS	CONTINUOUS	0.0004 MG/M^3	0.0008 MG/M^3

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MUSTARD AGENT (HD/HT) OPERATION	LOCATION	HISTORICAL BASELINE	ENGINEERING CONTROLS	OTHER CONTROLS	RELIABILITY OF CONTROLS	PCE (OSHA LEVEL OF DRESS)	RESPIRATORY PROTECTION	ASSIGNED PROTECTION FACTORS/MAXIMUM USE CONCENTRATIONS APF/MUC-WPL	DAILY OPERATION FREQUENCY	OPERATION DURATION IN MINUTES	DAILY EXPOSURE DURATION (DED) IN MINUTES (FREQUENCY x DURATION)	MONITORING EQUIPMENT*	MONITORING FEREQUENCY	HD/HT WPL EXPOSURE LIMIT 8 HR TWA	AIR MONITORING LEVEL CONCENTRATION (DED X MONITORING LEVEL CANNOT EXCEED 0.192 MG/MIN/M^3)
Reference: DA Pam 385-61 (3-4)(e) [SUPERCEDES U.S. ARMY IMPLEMENTATION GUIDANCE POLICY FOR REVISED AIRBORNE EXPOSURE LIMITS, 18 JUNE 2004, APPENDIX B (6)(e)]															
	3-4e(2)(e) 3-4 e(2)(f)	3-4e(2)a)	3-4e(2)(c)	3-4e(2)(c) 3-4e(2)(d)	3-4e(2)(m) 3-4e(2)(n)	3-4e(2)(b)	3-4e(2)b)	3-4e(2)	3-4e(2)(h) 3-4e(2)(g))	3-4e(2)(h) 3-4e(2)(i)	3-4e(2)(l)	3-4e(2)(k)			
MONITORING OF PROTECTIVE CLOTHING AND EQUIPMENT AND EQUIPMENT	MONITORING SHED	HISTORICAL MONITORING DATA RETAINED AT PCD	CONTAINMENT STRUCTURE (MONITORING SHED), GENERAL EXHAUST VENTILATION WITH FILTRATION, PLASTIC BAG ENCLOSURES	PROTECTIVE CLOTHING AND EQUIPMENT (PCE), LOW LEVEL AIR MONITORING, TRAINING, VISUAL INSPECTION, EYEWASH AND SHOWER FACILITIES, HYDRATION FLUIDS, DECONTAMINATION SOLUTIONS/EQUIPMENT WITH CATCH BASINS, BACKUP POWER, BACKUP VENTILATION SYSTEMS, MEDICAL SURVEILLANCE AND MONITORING, EMERGENCY MEDICAL RESPONSE, ACCESS CONTROL SIGNS BARRIERS, STANDARD OPERATING PROCEDURES, RADIO COMMUNICATIONS SYSTEMS	PCE INSPECTION, TESTING AND REPAIR PROGRAM; VENTILATION INSPECTION, TESTING AND REPAIR PROGRAMS; EQUIPMENT INSPECTION, TESTING, AND REPAIR PROGRAMS; DEPOT TRAINING PLANS AND CERTIFICATION PROCESSES; HEAT/COLD STRESS PREVENTION PROGRAM; DOCUMENT REVIEW AND UPDATING PROCESS, DECONTAMINANT QUALITY TESTING PROGRAM	OSHA LEVEL D	M40A1 (WORN)	50/0.02 MG/M^3 (NOT TO EXCEED 0.7 MG/MIN/M^3 PER DAY)	1	15	15	MINICAMS	CONTINUOUS	0.0004 MG/M^3	0.0008 MG/M^3
MUNITIONS MAINTENANCE OPERATIONS	BUILDING 491	HISTORICAL MONITORING DATA RETAINED AT PCD	CONTAINMENT STRUCTURE (VAPOR CONTAINMENT CHAMBER), GENERAL EXHAUST VENTILATION WITH FILTRATION	PROTECTIVE CLOTHING AND EQUIPMENT (PCE), LOW LEVEL AIR MONITORING, TRAINING, VISUAL INSPECTION, EYEWASH AND SHOWER FACILITIES, HYDRATION FLUIDS, DECONTAMINATION SOLUTIONS/EQUIPMENT WITH CATCH BASINS, BACKUP POWER, BACKUP VENTILATION SYSTEMS, MEDICAL SURVEILLANCE AND MONITORING, EMERGENCY MEDICAL RESPONSE, ACCESS CONTROL SIGNS/BARRIERS, STANDARD OPERATING PROCEDURES, RADIO COMMUNICATIONS SYSTEMS	PCE INSPECTION, TESTING AND REPAIR PROGRAM; VENTILATION INSPECTION, TESTING AND REPAIR PROGRAMS; EQUIPMENT INSPECTION, TESTING, AND REPAIR PROGRAMS; DEPOT TRAINING PLANS AND CERTIFICATION PROCESSES; HEAT/COLD STRESS PREVENTION PROGRAM; DOCUMENT REVIEW AND UPDATING PROCESS, DECONTAMINANT QUALITY TESTING PROGRAM	OSHA LEVEL D	M40A1 (SLUNG)	50/0.02 MG/M^3 (NOT TO EXCEED 0.7 MG/MIN/M^3 PER DAY)	1	240	240	MINICAMS	CONTINUOUS	0.0004 MG/M^3	0.0008 MG/M^3

UNCONTROLLED

UNCONTROLLED

APPENDIX G

MUSTARD AGENT (HD/HT) OPERATION	LOCATION	HISTORICAL BASELINE	ENGINEERING CONTROLS	OTHER CONTROLS	RELIABILITY OF CONTROLS	PCE (OSHA LEVEL OF DRESS)	RESPIRATORY PROTECTION	ASSIGNED PROTECTION FACTORS/MAXIMUM USE CONCENTRATIONS APF/MUC-WPL	DAILY OPERATION FREQUENCY	OPERATION DURATION IN MINUTES	DAILY EXPOSURE DURATION (DED) IN MINUTES (FREQUENCY x DURATION)	MONITORING EQUIPMENT*	MONITORING FEREQUENCY	HD/HT WPL EXPOSURE LIMIT 8 HR TWA	AIR MONITORING LEVEL CONCENTRATION (DED X MONITORING LEVEL CANNOT EXCEED 0.192 MG/MIN/M^3)
Reference: DA Pam 385-61 (3-4)(e) [SUPERCEDES U.S. ARMY IMPLEMENTATION GUIDANCE POLICY FOR REVISED AIRBORNE EXPOSURE LIMITS, 18 JUNE 2004, APPENDIX B (6)(e)]															
	3-4e(2)(e) 3-4 e(2)(f)	3-4e(2)a)	3-4e(2)(c)	3-4e(2)(c) 3-4e(2)(d)	3-4e(2)(m) 3-4e(2)(n)	3-4e(2)(b)	3-4e(2)b)	3-4e(2)	3-4e(2)(h) 3-4e(2)(g))	3-4e(2)(h) 3-4e(2)(l)	3-4e(2)(l)	3-4e(2)(k)			
UNCONTROLLED												* DEPOT AIR AREA MONITORING SYSTEM (DAAMS) IS USED FOR OPERATIONS >4 HOURS	HISTORICAL If unmasked operations are planned to exceed 4 hr/day, then 8 hr WPL collocated DAAMS will be utilized.		UNCONTROLLED
												** (MINICAMS) MINIATURE CONTINUOUS AIR MONITOR			

DEPARTMENT OF THE ARMY
PUEBLO CHEMICAL DEPOT
45825 HIGHWAY 96 EAST, PUEBLO, COLORADO 81006

Pueblo Chemical Depot Regulation No. 50-3

PCD SITE SPECIFIC MONITORING PROGRAM

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