AMA Analytical Services, Inc.
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF COUSTODY

(Please Refer To This Number For Inquires) 148424

P 3/3

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-114 Old Bay Lane
3. Address 2: Havre de Grace, MD 21078
4. Address 3:
5. Phone #: 410-942-0273 Fax #: 410-942-0254

Submittal Information:
1. Job Name: Pikesville Armory
2. Job Location:
3. Job #: [redacted] P.O. #:
4. Contact Person: [redacted] @ phone # 410-942-0273
5. Submitted by: [redacted] Signature: [redacted]

❑ Please include COC/field data sheets with results
Date & Time Results Required: ___/___/___ @ ___

Reporting Information (Results will be provided as soon as technically feasible): ❑ Immd. ❑ 24hr ❑ 48hr ❑ 72hr ❑ 5 Day + ❑ Immd. After-Hours* ❑ 24hr After-Hours* ❑ Late-Night* (*must be pre-scheduled)

❑ Verbals: ___ @ cell # ___ ❑ Fax Copy: ___ @ fax # ___ ❑ Email Copy: ___ @ ___

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
❑ NIOSH 7400 ___ (QTY)
❑ Fiberglass ___ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
❑ AHERA ___ (QTY)
❑ NIOSH 7402 ___ (QTY)
❑ Other (specify ___) ___ (QTY)
PLM Bulk
❑ EPA 600 – Visual Estimate ___ (QTY)
❑ EPA Point Count ___ (QTY)
❑ NY State Friable ___ (QTY)
❑ Grav. Reduction ELAP 198.1 ___ (QTY)
❑ Other (specify ___) ___ (QTY)

TEM Bulk
❑ ELAP 198.4/Chatfield ___ (QTY)
❑ NY State PLM/TEM ___ (QTY)
❑ Residual Ash ___ (QTY)
TEM Dust
❑ Qual. (pres/abs) Vacuum/Dust ___ (QTY)
❑ Quan. (s/area) Vacuum D5755-95 ___ (QTY)
❑ Quan. (s/area)Dust D6480-99 ___ (QTY)
TEM Water
❑ Qual. (pres/abs) ___ (QTY)
❑ ELAP 198.2/EPA 100.2 ___ (QTY)
❑ EPA 100.1 ___ (QTY)

❑ All samples received in good condition unless otherwise noted. (TEM Water samples ___ °C)

Lead Analysis
❑ Paint Chip ___ (QTY)
☑ Dust Wipe (wipe type Ghost) 36 (QTY)
❑ Air ___ (QTY)
❑ Soil/Solid ___ (QTY)
❑ TCLP ___ (QTY)
❑ Drinking Water ___ (QTY)
❑ Waste Water ___ (QTY)
❑ Dust Wipe Furnace (wipe type ___) ___ (QTY)

Mold - Direct Microscopic Analysis
❑ Spore-Trap ___ (QTY) ❑ Bulk ___ (QTY)
❑ Surface Swab ___ (QTY) ❑ Surface Vacuum Dust ___ (QTY)
❑ Surface Tape ___ (QTY) ❑ Other (Specify ___) ___ (QTY)

SAMPLE INFORMATION					ANALYSIS							MATRIX				
CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
PIK-120706-027		12/7/06		4x4				✓				✓				
PIK-120706-028																
PIK-120706-029																
PIK-120706-030																
PIK-120706-031																
PIK-120706-032																
PIK-120706-033																
PIK-120706-B1																
PIK-120706-B2																
PIK-120706-B3																

CLIENT CONTACT
(LABORATORY STAFF ONLY)

Date/Time: Contact: By:

Date/Time: Contact: By:

Date/Time: Contact: By:

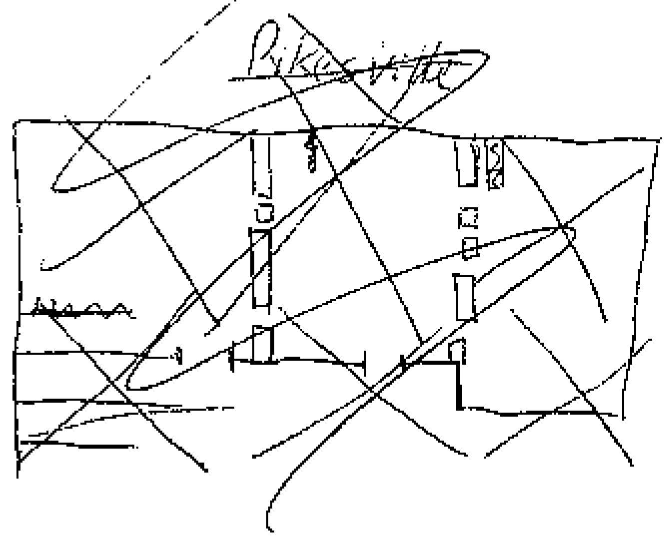
LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: ___/___/___ @ ___ Via: ___ By (Print): ___ Sign: ___
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ___ Sign: ___
3. Results Reported To: ___ Via: ___ Date: ___/___/___ Time: ___ Initials: ___
4. Comments: ___

WES-120606-019 - Locker Room Adjacent to Range

PR # 815

WES-120606-020 - outside Door to gym basketball court area

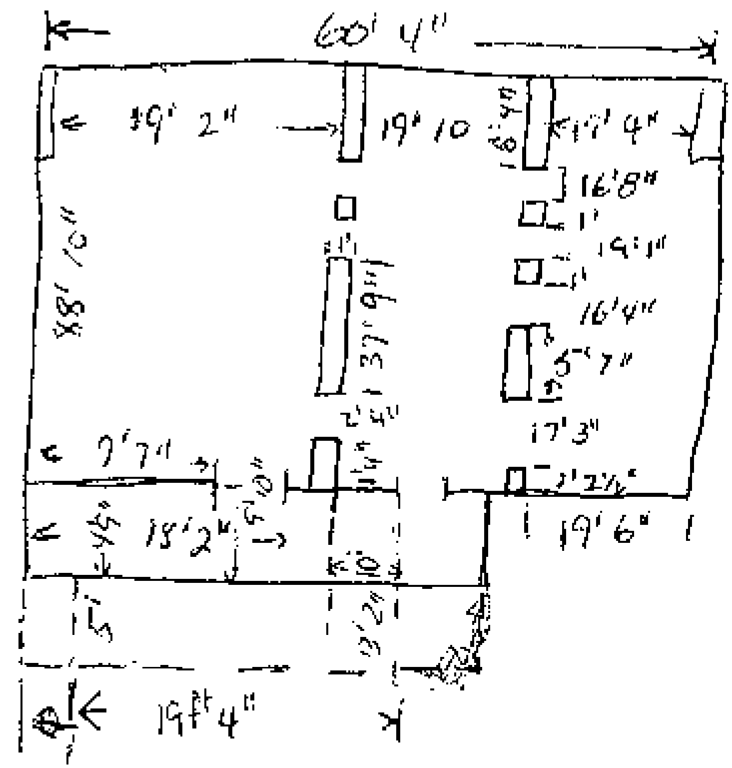
Pict # 816



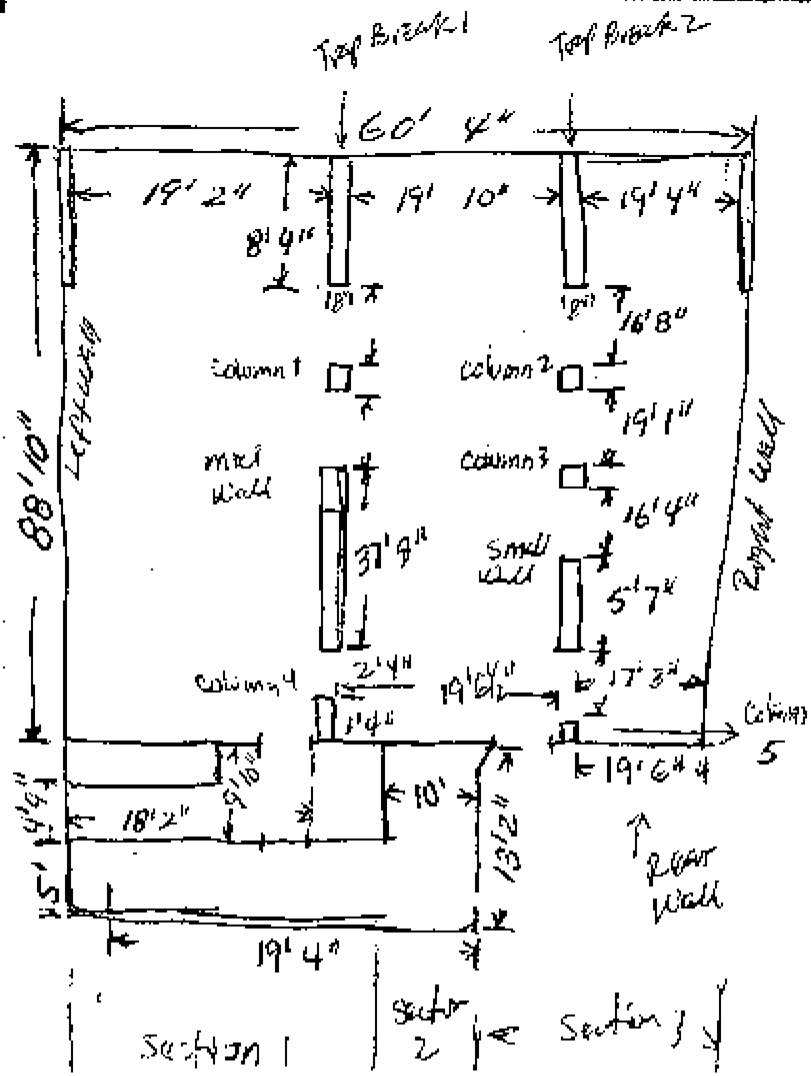
3rd BDE 29 ID

Pikesville - ANG Armory

~~Floor~~



19
3
57 30" 16



Floor Samples

PIK-120706-001 – Inside Room 211 adjacent to Range

□ 6' 3" → Door

Pic # 837

PIK-120706-002 – Entrance to range from Room 211

Door ← 2' 6" □ 6' 11" → Restroom

1' 4" Door to Range

Pic # 838

PIK-120706-003 – Inside restroom Room 211

□ 3' 11" → wall

Toilet

Pic # 839

PIK-120706-004 – Small area of Dead space before plenum to the left wall

Wall 2' 0" □ 6' 7" → Range Door

3' 7" Wall

Room 211

Pic # 840

PIK-120706-005 – Area cooler radiator in dead space before range door

2' ↑ Door to range
□ 8" → wall
↓ 6'
Door to Rm 211

Pic # 841

PIK-120706-006 – Left side door to range

□ 9'11" — opening
↓ 9'1"
Door Rm 211

Pic # 842

PIK-120706-007 – Outside Right entry to range next to room 211

Range Door 3' □ 5'3" Rm 211 Door
↓ 0" wall

Pic # 843

PIK-120706-008 – Restroom 210 outside the Containment area

□ 4' → Rm 210 Restroom wall
↓ 4' Door

Pic # 844

PIK-120706-009 – Window sill outside Rm 210 (restroom) on top of furnace radiator

Pic # 845

PIK-120706-010 – Hallway right outside Containment entrance.

□ 13'6" wall
↓ 13'
entrance to containment area

Pic # 846

Range Floor Right side

PIK-120706-011 – Floor inside right side next to middle column from the entrance (Repeat Sample)

wall ← 8" □ 1'2" → column
↓ 8'
Door to range right side

Pic # 847

PIK-120706-012 – Floor right side of entrance Door to right side (Repeat Sample)

column #A 3' □ 3' Door

Pic # 848

PIK - 120706 - 013 - Floor under radiator right side of Range

Wall ← 19' □ 8' → Door

Pic # 849

PIK - 120706 - 014 - Floor Sample on right side range next to right wall across from Small wall

Small wall ← 10'6" □ 3'6" Right wall

21' rear wall

(Repeat Sample)

Pic # 850

PIK-120706 - 015 - Floor Sample next to Column #3 on right side of Range

Column 3 31' □ 10' → wall

(Repeat Sample)

Pic # 851

PIK-120706 - 016 - Floor Sample Trap(?) midpoint between Trap Break 2 and right wall end of range right side

Trap Break 2 ← 9'1" □ 9'1" → Right wall

(repeat sample)

Pic # 852

PIK - 120706 - 017 - Floor Sample between small wall and mid wall (Repeat Sample)

Small wall ← 4' □ 16' → mid wall

Door 26'

Pic # 853

PIK - 120706 - 018 - Floor Sample next to Column 1 middle range area

→ □ 2" Column 1

Pic # 854
(Repeat Sample)

PIK - 120706 - 019 - Floor Sample next to Trap break 2 (repeat sample)

Trap Break 1 19'8" □ 2" Trap break

Pic # 855

Continue back

Range Floor left side

PIK-120706-020 – Floor Sample left side range Firing Position #3

Mid wall 9'7" □ 9'10" CPK wall

(Repeat Sample) Pic 856

PIK-120706-021 – Floor left side of break Trap 1 left side range

Left wall 19' wall □ Trap Break 1

(Repeat Sample) Pic 857

WALLS

PIK-120706-022 – Trap wall on the left side and left wall

3' □ wall 19' 10" Trap Break 1 Floor

(Repeat Sample)

Pic # 858

PIK-120706-023 – Wall Sample on the left side of Trap break 1

6' □ on left side of Trap bak 1 6'

(Repeat Sample) Pic 859

PIK-120706-024 – Sample on column 2 inside face of mid wall

□ 4'2" Floor

(Repeat Sample) Pic #860

PIK-120706-025 – Rear wall next to column 4

7' □ 3' Column 4 6'

(Repeat Sample)

Pic # 861

PIK-120706-026 – Wall Sample next to column 5 at Rear wall (Vertical)

column 5 □ Door 3'

Pic 862

PIK-120706-027 – Wall Sample of window sill at Rear wall next to column 5 (horizontal)

□ Door column 5 3'

Pic 863

PIK-120706-028 - Left side wall of the mid wall (Repeat Sample)

Rear Wall ← 18' □ 5' ↓ Floor

Pic #864

PIK-120706-029 - Left face of column #2 mid range (Repeat Sample)

□ 6' ↓ Floor

PIC 865

PIK-120706-030 - Right face of Trap Break 1 (Repeat Sample)

□ 6' ↓ Floor

Pic 866

PIK-120706-031 - Trap Break 2 Right ~~Left~~ Face (Repeat Sample)

□ 6' ↓ Floor

Pic 867

PIK-120706-032 - under covered window sill Right center (Repeat Sample)

□ 11' → Rear wall; 4' ↓ Floor

Pic 868

PIK-120706-033 - Rear wall (Repeat Sample)

Right wall ← 5' □ 4' ↓ Floor

Pic 869

PIK-120706-B1 Blank 1

PIK-120706-B2 Blank 2

PIK-120706-B2 Blank 3

PIK-120706-B3 Blank 4

PIK-120706-ASB1 - Wired mesh next to column 5 rear wall

PIK-120706 ASB2 - Brick under mesh Rear wall

PIK-120706-ASB3 - Behind window right side of Rear wall entrance door right side range

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0 · NY ELAP 10920 · AIHA 100470

Client:	National Guard Bureau	**Job Name:**	Pikesville Clear 4	**Chain Of Custody:**	150778
Address:	301-B1 Old Bay Lane, Attn: NGB-AVN-SL State Military Reservation	**Job Location:**	Pikesville Armory	**Date Submitted:**	12/19/2006
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	12/19/2006 **Report Date:** 19-Dec-06

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Final Result			Comments
0720056	20061215PIK4 01	Flame	Wipe	****	0.444	27.00	ug/ft²	<	27	ug/ft²	
0720057	20061215PIK4 02	Flame	Wipe	****	0.444	27.00	ug/ft²	<	27	ug/ft²	
0720058	20061215PIK4 03	Flame	Wipe	****	0.444	27.00	ug/ft²	<	27	ug/ft²	
0720059	20061215PIK4 04	Flame	Wipe	****	0.444	27.00	ug/ft²	<	27	ug/ft²	
0720060	20061215PIK4 05	Flame	Wipe	****	0.444	27.00	ug/ft²		96	ug/ft²	
0720061	20061215PIK4 06	Flame	Wipe	****	0.444	27.00	ug/ft²	<	27	ug/ft²	
0720062	20061215PIK4 07	Flame	Wipe	****	0.444	27.00	ug/ft²	<	27	ug/ft²	
0720063	20061215PIK4 08	Flame	Wipe	****	0.444	27.00	ug/ft²		3400	ug/ft²	
0720064	20061215PIK4 09	Flame	Wipe	****	0.444	27.00	ug/ft²		49	ug/ft²	
0720065	20061215PIK4 10	Flame	Wipe	****	0.444	27.00	ug/ft²		760	ug/ft²	
0720066	20061215PIK4 11	Flame	Wipe	****	0.444	27.00	ug/ft²	<	27	ug/ft²	
0720067	20061215PIK4 12	Flame	Wipe	****	0.444	27.00	ug/ft²		37	ug/ft²	
0720068	20061215PIK4 13	Flame	Wipe	****	0.444	27.00	ug/ft²	<	27	ug/ft²	
0720069	20061215PIK4 14	Flame	Wipe	****	0.444	27.00	ug/ft²		920	ug/ft²	
0720070	20061215PIK4 15	Flame	Wipe	****	0.444	27.00	ug/ft²		1100	ug/ft²	
0720071	20061215PIK4 16	Flame	Wipe	****	0.444	27.00	ug/ft²		130	ug/ft²	
0720072	20061215PIK4 17	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0720073	20061215PIK4 18	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP Accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0 NY ELAP 10920 AIHA 100470

Client:	National Guard Bureau	**Job Name:**	Pikesville Clear 4	**Chain Of Custody:**	150778
Address:	301-IH Old Bay Lane, Attn NGB-AVN-SI, State Military Reservation	**Job Location:**	Pikesville Armory	**Date Submitted:**	12/19/2006
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	12/19/2006
				Report Date:	04-Jan-07

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments
0720056	20061215PIK4 01	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0720057	20061215PIK4 02	Flame	Wipe	****	0.111	108.01 ug/ft²	~~< 110 ug/ft²~~	
0720058	20061215PIK4 03	Flame	Wipe	****	0.111	108.01 ug/ft²	~~< 110 ug/ft²~~	
0720059	20061215PIK4 04	Flame	Wipe	****	0.111	108.01 ug/ft²	< ~~110 ug/ft²~~	
0720060	20061215PIK4 05	Flame	Wipe	****	0.111	108.01 ug/ft²	380 ug/ft² 5	
0720061	20061215PIK4 06	Flame	Wipe	****	0.111	108.01 ug/ft²	< ~~110 ug/ft²~~	
0720062	20061215PIK4 07	Flame	Wipe	****	0.111	108.01 ug/ft²	< ~~110 ug/ft²~~	
0720063	20061215PIK4 08	Flame	Wipe	****	0.111	108.01 ug/ft²	~~13000 ug/ft²~~ 8	
0720064	20061215PIK4 09	Flame	Wipe	****	0.111	108.01 ug/ft²	~~200 ug/ft²~~	
0720065	20061215PIK4 10	Flame	Wipe	****	0.111	108.01 ug/ft²	~~3000 ug/ft²~~ 10	
0720066	20061215PIK4 11	Flame	Wipe	****	0.111	108.01 ug/ft²	< ~~110 ug/ft²~~	
0720067	20061215PIK4 12	Flame	Wipe	****	0.111	108.01 ug/ft²	~~150 ug/ft²~~	
0720068	20061215PIK4 13	Flame	Wipe	****	0.111	108.01 ug/ft²	< ~~110 ug/ft²~~	
0720069	20061215PIK4 14	Flame	Wipe	****	0.111	108.01 ug/ft²	~~2900 ug/ft²~~ 14	
0720070	20061215PIK4 15	Flame	Wipe	****	0.111	108.01 ug/ft²	~~4200 ug/ft²~~ 15	
0720071	20061215PIK4 16	Flame	Wipe	****	0.111	108.01 ug/ft²	~~540 ug/ft²~~ 16	
0720072	20061215PIK4 17	Flame	Wipe Blank	****	N/A	12.00 ug	< ~~12 ug~~	
0720073	20061215PIK4 18	Flame	Wipe Blank	****	N/A	12.00 ug	< ~~12 ug~~	

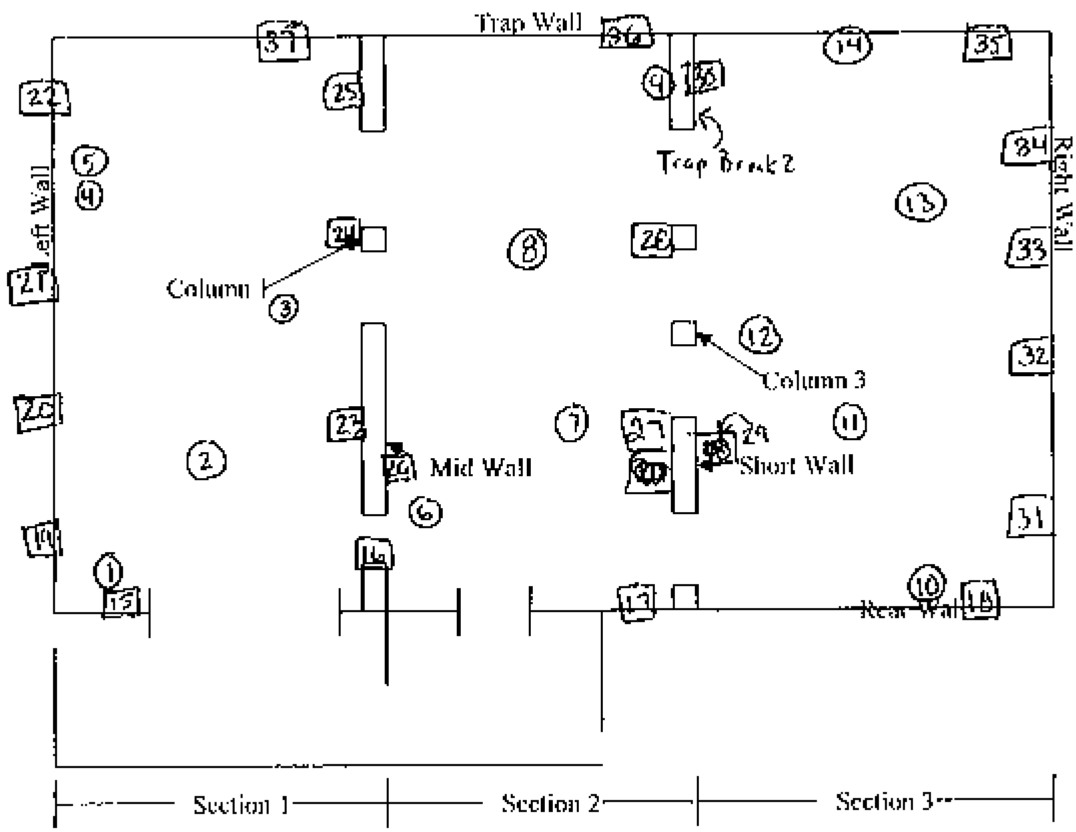
Pikesville Indoor Firing Range Clearance Sampling – ~~1st~~ 2nd Attempt
~~26 October 2006~~
28 November 2006

Large range, approximately 15 lanes.
Stone construction, slat and plaster visible in some areas.

Lead Check sticks tested positive for lead.

floor possibly sealed ?

Sampling Diagram:



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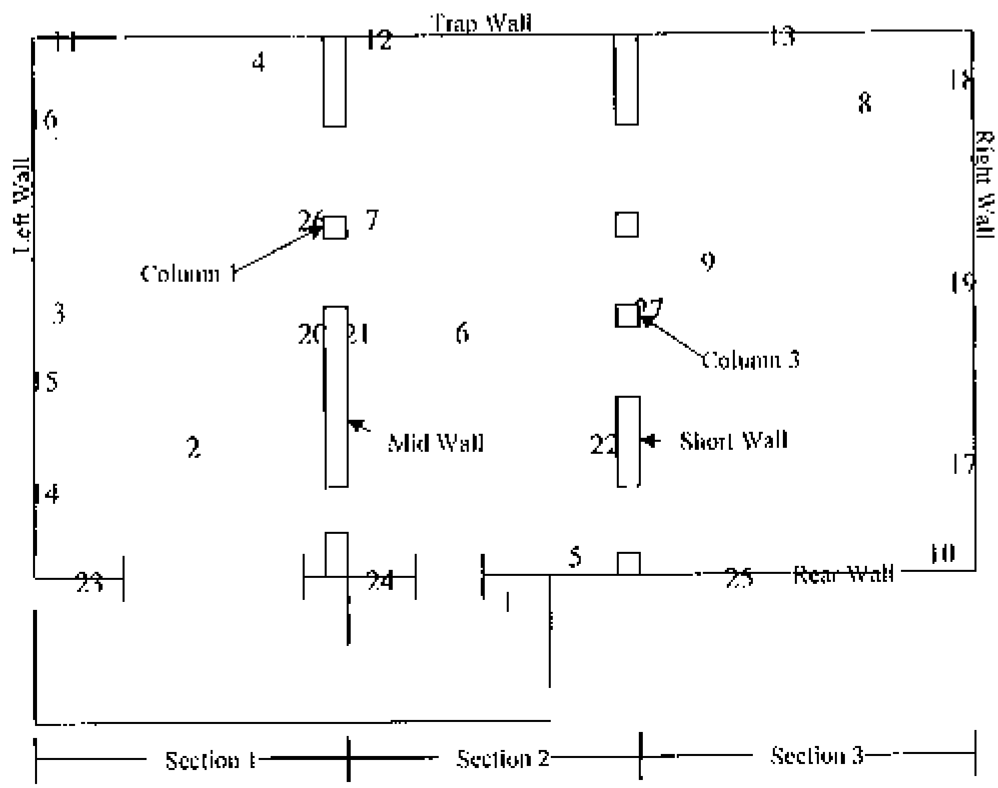
Pikesville Indoor Firing Range Clearance Sampling – 1st Attempt
26 October 2006

Large range, approximately 15 lanes.
Stone construction, slat and plaster visible in some areas.

Lead Check sticks tested positive for lead.

Sampling Diagram:



Pikesville Indoor Firing Range Clearance Sampling – 1st Attempt
26 October 2006

Sample Number	Sample Location
2006 1016 PKV1 01	Entry Area, floor, 0.5 ft right of door, adjacent to Rear wall
2006 1016 PKV1 02	Floor, Sec 1, 6 ft from Rear wall, 12 ft from Mid wall
2006 1016 PKV1 03	Floor, Sec 1, 54 ft from Rear wall, adjacent to Left wall
2006 1016 PKV1 04	Floor, Sec 1, adjacent to Trap wall, 18 ft from Left wall
2006 1016 PKV1 05	Floor, Sec 2, adjacent to Rear wall, 18 ft from Mid wall
2006 1016 PKV1 06	Floor, Sec 2, 48 ft from Rear wall, 12 ft Left of Column 3
2006 1016 PKV1 07	Floor, Sec 2, 70 ft from Rear wall, adjacent to Column 1
2006 1016 PKV1 08	Floor, Sec 3, 9 ft from Rear wall, 6 ft from Right wall
2006 1016 PKV1 09	Floor, Sec 3, 60 ft from Rear wall, 15 ft from Right wall
2006 1016 PKV1 10	Floor, Sec 3, corner of Rear wall and Right wall
2006 1016 PKV1 11	Wall, Trap, corner of Rear wall and Left wall, 3 ft from Floor
2006 1016 PKV1 12	Wall, Trap, adjacent to protruding column, 6 ft from Floor
2006 1016 PKV1 13	Wall, Trap, 9 ft from Right wall, 7 ft from Floor
2006 1016 PKV1 14	Wall, Left, 6 ft from Rear wall, 6 ft from Floor
2006 1016 PKV1 15	Wall, Left, 36 ft from Rear wall, 4 ft from Floor
2006 1016 PKV1 16	Wall, Left, 15 ft from Trap wall, 4 ft from Floor
2006 1016 PKV1 17	Wall, Right, 3 ft from Rear wall, 6 ft from Floor
2006 1016 PKV1 18	Wall, Right, 3 ft from Trap wall, 3 ft from Floor
2006 1016 PKV1 19	Wall, Right, 33 ft from Rear wall, 5 ft from Floor
2006 1016 PKV1 20	Wall, Mid, in sec 1, 3 ft from trap end, 6 ft from Floor
2006 1016 PKV1 21	Wall, Mid, in sec 2, 3 ft from trap end, 3 ft from Floor
2006 1016 PKV1 22	Wall, Short, in sec 2, centered on column, 6 ft from Floor
2006 1016 PKV1 23	Wall, Rear, 3 ft from Left wall, 4 ft from Floor
2006 1016 PKV1 24	Wall, Rear, in sec 2, 3 ft from Mid wall, 6 ft from Floor
2006 1016 PKV1 25	Wall, Rear, on glass, bottom row, closest to R wall, corner
2006 1016 PKV1 26	Column 1, in sec 1, 8 ft from Floor, centered
2006 1016 PKV1 27	Column 2, in sec 3, 5 ft from Floor, centered
2006 1016 PKV1 28	Blank
2006 1016 PKV1 29	Blank
2006 1016 PKV1 30	Blank

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AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

NVLAP 101143-0
NY ELAP 10920
AIHA 100470

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	Pikesville Clear 1	**Chain Of Custody:**	150772
Address:	301-III Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Pikesville Military Reservation	**Date Submitted:**	10/30/2006
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	10/30/2006
				Report Date:	30-Oct-06

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments
0708711	20061026PKV101	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0708712	20061026PKV102	Flame	Wipe	****	0.111	108.01 ug/ft²	2000 ug/ft²	
0708713	20061026PKV103	Flame	Wipe	****	0.111	108.01 ug/ft²	1000 ug/ft²	
0708714	20061026PKV104	Flame	Wipe	****	0.111	108.01 ug/ft²	7800 ug/ft²	
0708715	20061026PKV105	Flame	Wipe	****	0.111	108.01 ug/ft²	600 ug/ft²	
0708716	20061026PKV106	Flame	Wipe	****	0.111	108.01 ug/ft²	510 ug/ft²	
0708717	20061026PKV107	Flame	Wipe	****	0.111	108.01 ug/ft²	31000 ug/ft²	
0708718	20061026PKV108	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0708719	20061026PKV109	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0708720	20061026PKV110	Flame	Wipe	****	0.111	108.01 ug/ft²	2900 ug/ft²	
0708721	20061026PKV111	Flame	Wipe	****	0.111	108.01 ug/ft²	3700 ug/ft²	
0708722	20061026PKV112	Flame	Wipe	****	0.111	108.01 ug/ft²	2600 ug/ft²	
0708723	20061026PKV113	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0708724	20061026PKV114	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0708725	20061026PKV115	Flame	Wipe	****	0.111	108.01 ug/ft²	580 ug/ft²	
0708726	20061026PKV116	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0708727	20061026PKV117	Flame	Wipe	****	0.111	108.01 ug/ft²	230 ug/ft²	
0708728	20061026PKV118	Flame	Wipe	****	0.111	108.01 ug/ft²	35000 ug/ft²	
0708729	20061026PKV119	Flame	Wipe	****	0.111	108.01 ug/ft²	2100 ug/ft²	
0708730	20061026PKV120	Flame	Wipe	****	0.111	108.01 ug/ft²	1200 ug/ft²	

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0 · NY ELAP 10920 · AIHA 100470

Client:	National Guard Bureau	**Job Name:**	Pikesville Clear I	**Chain Of Custody:**	150772
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Pikesville Military Reservation	**Date Submitted:**	10/30/2006
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	10/30/2006 **Report Date:** 30-Oct-06
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0708731	20061026PKV121	Flame	Wipe	****	0.111	108.01	ug/ft²		180	ug/ft²	
0708732	20061026PKV122	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0708733	20061026PKV123	Flame	Wipe	****	0.111	108.01	ug/ft²		450	ug/ft²	
0708734	20061026PKV124	Flame	Wipe	****	0.111	108.01	ug/ft²		180	ug/ft²	
0708735	20061026PKV125	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0708736	20061026PKV126	Flame	Wipe	****	0.111	108.01	ug/ft²		1200	ug/ft²	
0708737	20061026PKV127	Flame	Wipe	****	0.111	108.01	ug/ft²		370	ug/ft²	
0708738	20061026PKV128	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0708739	20061026PKV129	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0708740	20061026PKV130	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B

See QC Summary for analytical results of quality control samples associated with these samples.

N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)

%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Analyst: [redacted] Technical Manager: [redacted]

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

JUN 12 2007

MCHB-TS-OFS

MEMORANDUM FOR National Guard Bureau Region North Industrial Hygiene Office (NGB-ARS-IHNE/Ms [redacted], 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Survey, MG Harry C. Ruhl Armory, Towson, MD, Report No. 55-ML-048L-05/07, 26 August 2005

1. Enclosed is the final copy of subject report and two CD-ROMs.

2. Our point of contact is Ms [redacted] at commercial (410) 436-5475/3118, DSN 584-5475/3118 or electronic mail: [redacted]@us.army.mil

FOR THE COMMANDER:

Encl

[redacted]
Director, Occupational Health Sciences

CF: (w/o CD-ROMs)
USACHPPM-NORTH (MCHB-AN-IH/MR. [redacted])

Readiness thru Health

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U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

[illegible]

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- *Integrity is the foundation*
- *Excellence is the standard*
- *Customer satisfaction is the focus*
- *Its people are the most valued resource*
- *Continuous quality improvement is its pathway*

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

CHPPM FORM 433 E (MCHB-CS-IPD), OCT 03 (reverse)

U.S. Army Center for Health Promotion and Preventive Medicine

USACHPPM

INDUSTRIAL HYGIENE BASELINE SURVEY
REPORT NO. 55-ML-048L-05/07
MARYLAND NATIONAL GUARD FACILITIES
MG HARRY C. RUHL ARMORY
TOWSON, MARYLAND
26 AUGUST 2005

Distribution limited to U.S. Government agencies only. Requests for this document must be referred to the National Guard Bureau Region North Industrial Hygiene Office (NGB-ARS-IHNE/Ms. Vanessa Franchere), 301-IH Old Bay Lane, Havre de Grace, MD 21078

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EXECUTIVE SUMMARY
INDUSTRIAL HYGIENE BASELINE SURVEY
REPORT NO. 55-ML-048L-05/07
MARYLAND ARMY NATIONAL GUARD FACILITIES
MG HARRY C. RUHL ARMORY
TOWSON, MARYLAND
26 AUGUST 2005

1. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard (MDARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions.

2. CONCLUSIONS. Significant health and safety concerns were: high levels of lead in dust and deteriorating lead-containing paint in the former indoor firing range (IFR) where toys and utensils were being stored; inadequate vehicle exhaust ventilation; incompatible chemical storage; incomplete enrollment in the Hearing Conservation Program (HCP); and inadequate lighting.

3. RECOMMENDATIONS.

a. Lead Exposure. Health Risk Assessment Code (RAC) 3 for Child Exposure. Health RAC 4 for Adult Exposure. Clean horizontal surfaces in the administrative areas to the National Guard Bureau (NGB) Region North Industrial Hygiene Office and the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended levels. Follow the guidance in Appendix E and National Guard Pamphlet 420-15. Address all potential lead hazards before continuing to extend the use of this facility to children. If children will visit this facility, clean the floors in the Drill Hall and Classroom to the Environmental Protection Agency and State of Maryland lead in dust standards for young children, and clean other horizontal surfaces in the Drill Hall and Conference Room to the NGB Region North Industrial Hygiene Office and USACHPPM recommended level for lead in dust on frequently contacted surfaces. Eliminate the moisture source causing mold and deteriorating paint in the former IFR and repair paint. Ensure that personnel wear disposable gloves and disposable coveralls as extra protection when cleaning in all areas identified as having elevated levels of lead. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after clean up.

EXSUM, MDARNG IH Baseline Survey, MG Harry C. Ruhl Armory, Towson, MD, Report No. 55-ML-048L-05/07, 26 August 2005

b. Vehicle Exhaust Ventilation. Health RAC 3. Install a system that can provide at least 1,500 cubic feet per minute per drop to accommodate large turbocharged diesel engines. Evaluate the systems to ensure that exhaust generated by the engine is removed.

c. Safety. Safety RAC 3. Store the Super Tropical Bleach in a separate cabinet or storage area away from potential water sources. Inspect other stored chemicals for compatibility and relocate them as needed.

d. Lighting. Health RAC 4. Provide portable task lighting to conform to the Illuminating Engineering Society of North America guidelines.

e. Safety and Occupational Health Programs. Health RAC 3. Ensure that part time NGB employees are enrolled in the HCP. Ensure that personnel wear hearing protection when working in the automotive bay and in areas that require hearing protection. Ensure that personnel receive baseline and annual audiometric exams.

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MDARNG IH Baseline Survey, MG Harry C. Ruhl Armory, Towson, MD, Report No. 55-ML-048L-05/07, 26 August 2005

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INDUSTRIAL HYGIENE BASELINE SURVEY
REPORT NO. 55-ML-048L-05/07
MARYLAND ARMY NATIONAL GUARD FACILITIES
MG HARRY C. RUHL ARMORY
TOWSON, MARYLAND
26 AUGUST 2005

1. REFERENCES. See Appendix A.

2. PURPOSE. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) MG Harry C. Ruhl Armory, Towson, MD, to identify and measure the existence and extent of potentially hazardous operations or conditions. This survey will serve as a baseline so that an occupational exposure history can be compiled for each civilian or military employee.

3. AUTHORITY. Fax, National Guard Bureau (NGB) Region North Industrial Hygiene Office (NGB-ARS-IHNE/Ms.[redacted], 22 June 2004, subject: SAB.

4. BACKGROUND INFORMATION.

a. Background. The resident units were the 129th Signal Battalion and the Headquarters Command Division Support Command. The original building, which included an attached automotive maintenance shop, was built in 1956. An addition was constructed in 1998 that included a weight room, classroom, and an office. A disused indoor firing range (IFR) had been converted into a storage room (See Photograph 1, Appendix B). The bullet trap had been removed. The IFR had reportedly been decontaminated, although no records of decontamination could be located, and there was a lead hazard warning sign posted outside the room.

b. Armory Use by Children. The manager stated that the Armory was used for family functions. After the survey, we informed the NGB Region North Industrial Hygiene Office of high lead in dust sample results. As of late 2005, the Maryland Military Department was advertising Ruhl Armory as available for rental for activities that include young children. We do not know whether the lead had been cleaned up.

c. Armory Manager. The Armory manager was Mr. [redacted] Phone: 410-616-0520.

Use of trademarked names does not imply endorsement by the U.S. Army but is intended only to assist in identification of a specific product.

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5. METHODOLOGY.

a. Assessment Criteria. Army Regulation 40-5 contains the requirement that airborne chemical exposures in Army facilities must comply with the lower of the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit or the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value®. The NGB Region North Industrial Hygiene Office criterion for lead in surface dust is discussed in Appendix C. The ACGIH provides criteria for industrial ventilation systems. The American Society of Heating, Refrigeration, and Air-conditioning Engineers publish criteria for indoor air quality. The National Fire Protection Association National Fire Codes provides standards for fire and life safety. The Illumination Engineering Society – North America provides standards for minimum light levels. The Environmental Protection Agency (EPA) provides drinking water standards.

b. Calibration. All instruments were calibrated in accordance with manufacturer's instructions using National Institute of Standards and Testing traceable method.

c. Methodology. The survey consisted of the collection of indoor air quality and ventilation measurements, sampling surface dust and paint for lead, observation of work practices and procedures, and employee interviews.

6. FACILITY EVALUATION.

a. Physical Condition of Facilities.

(1) Paint. The age of the original building indicated that the presence of lead in paint was likely. The converted IFR had extensive areas of deteriorated paint (See Photograph 2, Appendix B). The manager stated that there were no records of lead-based paint (LBP) abatement at the Armory.

(2) Asbestos. The manager stated that all asbestos had been abated in the Armory. A site Asbestos Management Program Plan was found.

(3) Mold and Moisture Problems. Mold was observed on the walls of the converted IFR (See Photograph 2, Appendix B).

(4) Safety Hazards. The only safety hazard observed was improper storage of a container of Super Tropical Bleach in the Petroleum Oil and Lubricant/Flammable Storage Room. This product is caustic and corrosive and should only be stored with other oxidizers. We separated the product from the other stored items during the survey.

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(5) Heating, Ventilation, and Air-Conditioning (HVAC) Systems. The building was heated and cooled by central HVAC systems.

b. Vehicle Exhaust Ventilation System. Airflow measurements were conducted. No vehicle maintenance personnel were present the day of the survey.

c. Safety and Occupational Health Programs. Employees participated in the Armory Hazard Communication (HAZCOM) Program. There were no known tasks requiring respiratory protection. Employees were enrolled in a separate Hearing Conservation Program (HCP) for part time National Guard employees.

d. Noise Dosimetry. No noise producing operations were conducted the day of the survey.

e. Lighting. Lighting measurements were conducted to determine if the lighting in the Armory met the Illuminating Engineering Society of North America (IESNA) recommended guidelines. Lighting was measured in foot candles using a light meter.

f. Indoor Air Quality (IAQ). Measurements were conducted to determine if the IAQ parameters met the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) recommended guidelines, and the ACGIH exposure limits adopted by the Army.

7. ASSESSMENT CRITERIA FOR LEAD.

a. Lead in Air. The Army complies with the OSHA 8 hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter of air.

b. Lead in Dust.

(1) The EPA and State of Maryland limits for lead in dust are 40 micrograms per square foot ($\mu g/ft^2$) on floors, 250 $\mu g/ft^2$ on windowsills, and 400 $\mu g/ft^2$ in window troughs. These limits apply to pre-1978 Army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The NGB Region North Industrial Hygiene Office concurs with the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended maximum level of 200 $\mu g/ft^2$ on floors and surfaces frequently contacted by facility employees, which is more stringent for windowsills than the EPA/State standards. This limit was adopted from guidance in OSHA CPL 02-02-58. Additional information is provided in Appendix C.

c. Lead in Paint. Paint containing lead levels of 0.5 percent or more by weight in dried solid (also reported as 5,000 milligrams per kilogram) is considered to be Lead Based Paint

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(LBP) according to both Federal and Maryland State Regulations. Paint containing lead levels of more than 0.7
milligrams per square centimeter is considered to be LBP according to Maryland State Regulations. In Army Regulation 420-70, Buildings and Structures, lead-contaminated paint (LCP) is defined as any paint containing detectable amounts of lead. The Army considers LCP to be potentially hazardous to children if it is disturbed or deteriorating.

8. SAMPLING RESULTS AND DISCUSSION.

a. Lead Sampling Locations and Results. Samples were collected for lead on surfaces (wipe samples), and by bulk paint samples to determine the presence of lead hazards. The laboratory report is in Appendix D.

b. Lead in Dust. Lead in dust sample locations and analytical results are shown in Table 1. Sample results greater than 40 $\mu g/ft^2$ for floors or 200 $\mu g/ft^2$ for other surfaces are highlighted. High levels of lead were found throughout the converted IFR areas.

MDARNG IH Baseline Survey, MG Harry C. Ruhl Armory, Towson, MD, Report No. 55-ML-048L-05/07, 26 August 2005

TABLE 1. LEAD IN SURFACE DUST

Wipe Sample Number	Location of Samples	Result (µg/ft²)
RUHLW01	Blank	<2.7
RUHLW02	IFR Bullet Trap Corner	45,000
RUHLW03	IFR Light Fixture	80
RUHLW04	IFR Kitchen Supplies	9.4
RUHLW05	IFR Shelf	310
RUHLW06	IFR Plastic Utensils	13
RUHLW07	Blank	3.3
RUHLW08	IFR Heater	1,500
RUHLW09	IFR Cage Storage Toy Box	5.6
RUHLW10	IFR Bullet Trap Duct Work	3,400
RUHLW11	IFR Cage Storage Christmas Supplies	23
RUHLW12	Blank	<2.7
RUHLW13	IFR Storage Tent Bag Exterior	170
RUHLW14	IFR Storage Tent Camouflage	36
RUHLW15	IFR Outside Doorway End of Hallway	36
RUHLW16	Drill Floor Center	6.6
RUHLW17	Drill Floor North East Corner	3.6
RUHLW18	Blank	<2.7
RUHLW19	Drill Floor North West Corner	<2.7
RUHLW20	Drill Floor South West Corner	5.1
RUHLW21	Drill Floor South East Corner	4.1
RUHLW22	Drill Hall Supply Room Door	<2.7
RUHLW23	Drill Hall Chair	3.6
RUHLW24	Room 112 A Vault	1,100
RUHLW25	Room 124 Vault	100
RUHLW26	Blank	<2.7
RUHLW27	Kitchen- Max Soap Dispenser	9.21
RUHLW28	Dining Hall- Top of Heater	35
RUHLW29	Room 206- File Cabinet Northeast Exit Door	11
RUHLW30	Room 206 Second Floor Logistics	9.7
RUHLW31	Second Floor Hallway	<2.7
RUHLW32	Second Floor Foyer (Original Building)	3.8
RUHLW33	Room 206 Supply Air Vent	<2.7
RUHLW34	Blank	<2.7
RUHLW35	Shop Office Desk	4.3
RUHLW36	Roof Air Supply	15
RUHLW37	Roof Air Return	11

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(1) Child Lead Exposure. Three lead in dust sample results exceeded the EPA and the State of Maryland lead exposure standard for children of 40 µg/ft² on floors and 250 µg/ft² on windowsills. Some boxes of toys were stored in areas of the former IFR and were therefore liable to become contaminated (See Photograph 3, Appendix B). Some of the toys were made of fabrics that could not be easily cleaned. The toys were owned by the Family Support Group that resides in the Armory. We notified the Armory manager who stated that the toys would be removed and discarded as soon as possible.

(2) Adult Lead Exposure. Three lead in dust results exceeded the NGB Region North Industrial Hygiene Office and USACHPPM recommended maximum level for lead in dust on frequently contacted surfaces. There were very high levels of lead in dust throughout the converted IFR storage areas. Personnel working in these areas were potentially exposed to lead, and may have been tracking lead out of the area and redistributing it into adjacent rooms in the Armory. Photograph 4, Appendix B shows the lead hazard warning posted outside the converted IFR.

c. <u>Lead in Paint</u>. The deteriorated paint sample result was below the EPA standard for LBP of 0.5 percent lead in paint, and is referred to as LCP. Deteriorated LCP is potentially hazardous to employees and children.

d. <u>Vehicle Exhaust Ventilation System</u>. Table 2 summarizes the vehicle exhaust system measurements. Photograph 5, Appendix B, shows one of the two drops.

TABLE 2. Vehicle Exhaust Ventilation Flow Rates.

Tailpipe Exhaust Drop #	Average Face Velocity (feet per minute) (fpm)	Duct Opening Diameter (in) / Area (ft^2)	Calculated Flow Rate (cubic feet per minute) (cfm)
1	1338	7.5" / 0.2925	391
2	1410	7.5" / 0.2925	412

(1) Vehicle exhaust ventilation was measured using a thermoanemometer. Both drops had a 7½ inch flanged opening.

(2) The manager stated that the vehicles serviced included 2½ and 5 ton diesel trucks.

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(3) The system should provide at least 1,500 cubic feet per minute (cfm) exhaust at each drop in accordance with the ACGIH Industrial Ventilation Manual recommendation for 9 liter displacement turbocharged diesel engines run at 1,000 revolutions per minute. This exhaust rate is intended to accommodate large turbocharged diesel engines that are, or may be, maintained at this Organizational Maintenance Shop. Neither drop met this criterion, and the fan was unlikely to be able to meet it even if fitted with a single larger drop.

c. IAQ. Table 3 summarizes IAQ measurements.

TABLE 3. INDOOR AIR QUALITY MEASUREMENTS

Location	CO_2 (ppm)	CO_2 Standard	Temp (°F)	T Standard (°F) (summer)	T Standard (°F) (winter)	RH (%)	RH Standard (%)	CO (ppm)	CO Exposure Limit (ppm)
Outdoors	345		75.0			48.0		0	
Automotive Bay	454	1080	76.0	71-81	68.0-74.5	54.0	30-60	6	25
IFR Bullet Trap	680	1080	78.0	71-81	68.0-74.5	49.0	30-60	NA	NA
Drill Hall	540	1080	72.0	71-81	68.0-74.5	45.0	30-60	NA	NA
Dining Hall	580	1080	77.0	71-81	68.0-74.5	43.0	30-60	NA	NA
Room 206	450	1080	77.0	71-81	68.0-74.5	44.0	30-60	NA	NA
Room 118	575	1080	75.0	71-81	68.0-74.5	47.0	30-60	NA	NA

(1) Temperature. The indoor temperatures of all rooms sampled were within the ASHRAE recommended guidelines of 71-81 degrees Fahrenheit for an acceptable thermal environment in the summer at 50 percent relative humidity (RH).

(2) Carbon Dioxide. The indoor carbon dioxide levels for all rooms sampled were within the ASHRAE recommended guidelines. The outdoor carbon dioxide measurement was 345 parts per million (ppm) versus a true value of approximately 380 ppm, indicating that readings had a downward bias. The ASHRAE recommends, for occupant comfort, maintaining carbon dioxide levels below the value of 700 ppm plus the outdoor ambient level. Therefore, carbon dioxide levels should be maintained below 1,045 ppm (700 ppm plus 380 ppm). All measured spaces complied, even after accounting for readings being biased low.

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(3) RH. The RH levels in the rooms were all within the ASHRAE recommended guidelines of 30-60 percent RH.

(4) Carbon Monoxide. Carbon monoxide levels were well below the 25 ppm 8-hour time-weighted average ACGIH exposure limit adopted by the Army.

f. Lighting. Table 4 summarizes the lighting measurements. Lighting levels were measured throughout the Armory. Several areas of the Maintenance Bay, the Drill Hall, the Arms Room, and the Division Support Command Supply Room Storage area were not adequately lit. According to the IESNA these areas should have at least 50 foot candles of illumination.

TABLE 4. LIGHTING

Location	Measurement (Foot candles)	Standard (Foot candles)
Maintenance Bay Area	24.4- 29.5	75
Drill Hall (Center, Doors Open)	18.0	50
Dining Hall	70.0-80.0	50
Room 206 (Table, Center of Room)	48.0	50
Room 118	65.0	50
Arms Room 124 HHC DISCOM	29.5-31.0	50
DISCOM Supply Room NCO Office	55.0	50
DISCOM Supply Room Storage Area	13.0	50

g. Safety and Occupational Health Programs.

(1) HAZCOM (Title 29 Code of Federal Regulations (CFR) 1910.1200). Armory records document that employees attended annual HAZCOM training. Material Safety Data Sheets and appropriate safety signs were in a central location and easily accessible to employees. A comprehensive Hazardous Materials Inventory was maintained in the Armory.

(2) Hearing Conservation Program (29 CFR 1910.95 and Department of the Army Pamphlet 40-501). According to LTC Sharon Hoffman, MDARNG Safety and Occupational Health Manager, automotive maintenance personnel were not enrolled in the HCP because they were "traditional" or part time NGB employees. The MDARNG is currently working on an initiative to include personnel classified as part time employees statewide in the HCP.

9. CONCLUSIONS. Significant health and safety concerns were: high levels of lead in dust and deteriorating lead-containing paint in the former IFR where toys and utensils were being stored; inadequate vehicle exhaust ventilation; incompatible chemical storage; incomplete enrolment in the HCP; and inadequate lighting.

10. RECOMMENDATIONS. The Department of Defense Instruction 6055.1 provides Risk Assessment Codes (RACs) for health hazards, a procedure which allows assessment of the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and combines the hazard severity and accident probability into a single number. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

a. Lead Exposure. Health RAC 3 for Child Exposure. Health RAC 4 for Adult Exposure. Clean horizontal surfaces in the administrative areas to the NGB Region North Industrial Hygiene Office and USACHPPM recommended levels. Follow the guidance in Appendix E and National Guard Pamphlet 420-15. Address all potential lead hazards before continuing to extend the use of this facility to children. If children will visit this facility, clean the floors in the Drill Hall and Classroom to the EPA and State of Maryland lead in dust standards for young children, and clean other horizontal surfaces in the Drill Hall and Conference Room to the NGB Region North Industrial Hygiene Office and USACHPPM recommended level for lead in dust on frequently contacted surfaces. Eliminate the moisture source causing mold and deteriorating paint in the former IFR and repair paint. Ensure that personnel wear disposable gloves and disposable coveralls as extra protection when cleaning in all areas identified as having elevated levels of lead. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after clean up.

b. Vehicle Exhaust Ventilation. Health RAC 3. Install a system that can provide at least 1,500 cfm per drop to accommodate large turbocharged diesel engines. Evaluate the systems to ensure that exhaust generated by the engine is removed.

c. Safety. Safety RAC 3. Store the Super Tropical Bleach in a separate cabinet or storage area away from potential water sources. Inspect other stored chemicals for compatibility and relocate them as needed.

d. Lighting. Health RAC 4. Provide portable task lighting to conform to the IESNA guidelines.

e. Safety and Occupational Health Programs. Health RAC 3. Ensure that part time NGB employees are enrolled in the HCP. Ensure that personnel wear hearing protection when working in the automotive bay and in areas that require hearing protection. Ensure that personnel receive baseline and annual audiometric exams.

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MDARNG IH Baseline Survey, MG Harry C. Ruhl Armory, Towson, MD, Report No. 55-ML-048L-05/07, 26 August 2005

11. ADDITIONAL ASSISTANCE. For additional assistance or questions concerning this report, please contact the undersigned at DSN 584-3118, commercial 410-436-3118, or by electronic mail: [redacted]@us.army.mil

[redacted]

Industrial Hygienist
USACHPPM Lead and Asbestos Team Leader
Industrial Hygiene Field Services Program

APPROVED:

[redacted]

MAJ, MS
Administrative Program Manager
Industrial Hygiene Field Services Program

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APPENDIX A

REFERENCES

Literature Cited

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APPENDIX B

PHOTOGRAPHS

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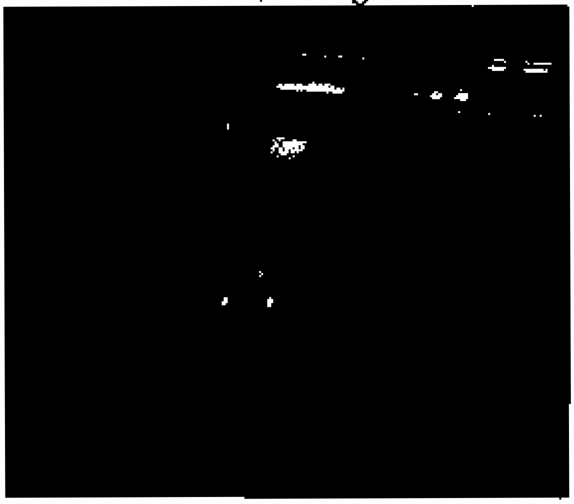
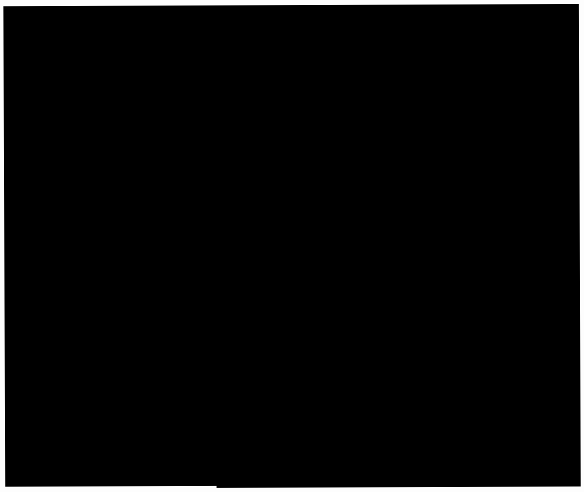
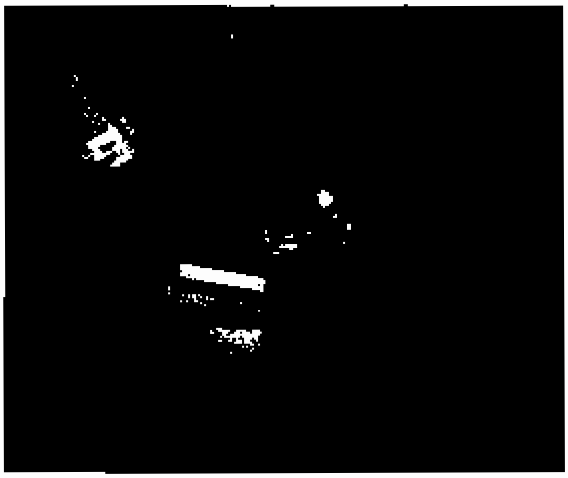


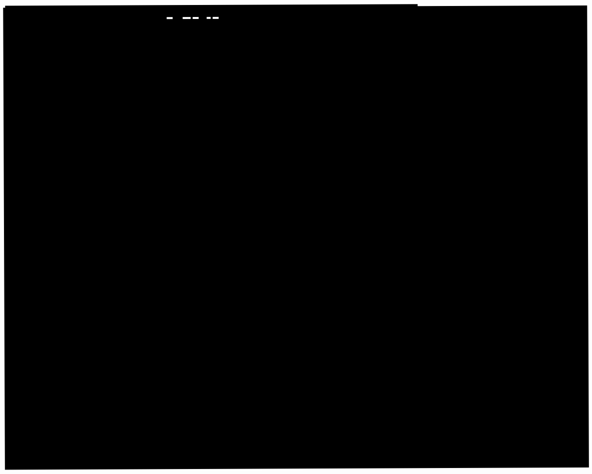
Photograph 1. Converted IFR - Storage Room



Photograph 2. Converted IFR – Deteriorated LCP and Mold



Photograph 3. Converted IFR - Toy Storage



Photograph 4. Converted IFR -Lead Hazard Sign

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Photograph 5. Vehicle Exhaust Ventilation System

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MDARNG IH Baseline Survey, MG Harry C. Ruhl Armory, Towson, MD, Report No. 55-ML-048L-05/07, 26 August 2005

APPENDIX C

PROPOSED CRITERIA FOR LEAD

Subject: Recommendations for Surface Lead Dust in Armories

1. In armories that do not contain childcare facilities, the National Guard Bureau (NGB) Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 micrograms per square foot ($\mu g/ft^2$). If a special function will be held in which children will be present in this facility, consider thoroughly cleaning the areas that will be accessible to children prior to the function. This guidance is based on professional judgment, risk assessments, adaptation of Occupational Safety and Health Administration (OSHA) guidance, and feasibility of cleaning to a certain level.

a. Environmental Protection Agency (EPA) standards (40 Code of Federal Regulations (CFR) 745.227(h)(3)) are not directly applicable because they are criteria for dust-lead hazards developed for floors (40 $\mu g/ft^2$) and windowsills (250 $\mu g/ft^2$) in residential dwellings and child occupied facilities. A child occupied facility is defined as a building, or portion of a building, constructed prior to 1978, visited regularly by the same child, 6 years of age or under, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hours and the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60 hours. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. The OSHA has no specific requirement for work area surfaces. The lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead dust. In workplaces where lead dust is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. The OSHA used to cite a level of 200 $\mu g/ft^2$ in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 $\mu g/ft^2$ is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

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MDARNG IH Baseline Survey, MG Harry C. Ruhl Armory, Towson, MD, Report No. 55-ML-048L-05/07, 26 August 2005

e. It should be noted that levels above these recommendations do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All states will receive this guidance when it is completed. In the interim, we recommend the following actions:

a. Clean all areas that will be accessible to children to the EPA dust-lead standard for children 6 years of age or under (40 $\mu g/ft^2$ on floors and 250 $\mu g/ft^2$ on windowsills).

b. Refer to the local authorities' regulations since they can be more stringent than Federal regulations.

c. Post signs in the area to inform people of the presence of lead dust and its effects.

d. If Soldiers clean weapons in the facility, change the policy so that they cannot clean their weapons in the facility, or if they are allowed to clean their weapons indoors, they must clean the area by wet wiping and mopping the area when they are done.

e. If the paint is peeling, contact the state Environmental Office to test for lead content and provide recommendations.

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APPENDIX D

LABORATORY REPORT

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AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	RUHL Armory	**Chain Of Custody:**	142990		
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Towson, MD	**Date Submitted:**	9/7/2005		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	Not Provided	**Date Analyzed:**	9/9/2005	**Report Date:**	09-Sep-05
Attention:	[redacted]						

Summary of Atomic Absorption Analysis for Lead

Page 1 of 3

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Final Result		Comments
0564267	RUHL-W-01	Furnace	Wipe	****	0.111	2.70	ug/ft²	< 2.7	ug/ft²	
0564268	RUHL-W-02	Furnace	Wipe	****	0.111	13501.35	ug/ft²	45000	ug/ft²	
0564269	RUHL-W-03	Furnace	Wipe	****	0.111	33.75	ug/ft²	80	ug/ft²	
0564270	RUHL-W-04	Furnace	Wipe	****	0.111	2.70	ug/ft²	9.4	ug/ft²	
0564271	RUHL-W-05	Furnace	Wipe	****	0.111	33.75	ug/ft²	310	ug/ft²	
0564272	RUHL-W-06	Furnace	Wipe	****	0.111	2.70	ug/ft²	13	ug/ft²	
0564273	RUHL-W-07	Furnace	Wipe	****	0.111	2.70	ug/ft²	3.3	ug/ft²	
0564274	RUHL-W-08	Furnace	Wipe	****	0.111	337.53	ug/ft²	1500	ug/ft²	
0564275	RUHL-W-09	Furnace	Wipe	****	0.111	2.70	ug/ft²	5.6	ug/ft²	
0564276	RUHL-W-10	Furnace	Wipe	****	0.111	1350.14	ug/ft²	3400	ug/ft²	
0564277	RUHL-W-11	Furnace	Wipe	****	0.111	13.50	ug/ft²	23	ug/ft²	
0564278	RUHL-W-12	Furnace	Wipe	****	0.111	2.70	ug/ft²	< 2.7	ug/ft²	
0564279	RUHL-W-13	Furnace	Wipe	****	0.111	33.75	ug/ft²	170	ug/ft²	
0564280	RUHL-W-14	Furnace	Wipe	****	0.111	33.75	ug/ft²	36	ug/ft²	
0564281	RUHL-W-15	Furnace	Wipe	****	0.111	33.75	ug/ft²	36	ug/ft²	
0564282	RUHL-W-16	Furnace	Wipe	****	0.111	2.70	ug/ft²	6.6	ug/ft²	
0564283	RUHL-W-17	Furnace	Wipe	****	0.111	2.70	ug/ft²	3.6	ug/ft²	
0564284	RUHL-W-18	Furnace	Wipe	****	0.111	2.70	ug/ft²	< 2.7	ug/ft²	
0564285	RUHL-W-19	Furnace	Wipe	****	0.111	2.70	ug/ft²	< 2.7	ug/ft²	
0564286	RUHL-W-20	Furnace	Wipe	****	0.111	2.70	ug/ft²	5.1	ug/ft²	

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP Accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

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AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0
NY ELAP 10920
AIHA 100470

Client:	National Guard Bureau	**Job Name:**	RUHL Armory	**Chain Of Custody:**	142990
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Towson, MD	**Date Submitted:**	9/7/2005
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	9/9/2005
				Report Date:	09-Sep-05

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Final Result		Comments
0564287	RUHL-W-21	Furnace	Wipe	****	0.111	2.70	ug/ft²	4.1	ug/ft²	
0564288	RUHL-W-22	Furnace	Wipe	****	0.111	2.70	ug/ft²	< 2.7	ug/ft²	
0564289	RUHL-W-23	Furnace	Wipe	****	0.111	2.70	ug/ft²	3.6	ug/ft²	
0564290	RUHL-W-24	Furnace	Wipe	****	0.111	135.01	ug/ft²	1100	ug/ft²	
0564291	RUHL-W-25	Furnace	Wipe	****	0.111	33.75	ug/ft²	100	ug/ft²	
0564292	RUHL-W-26	Furnace	Wipe	****	0.111	2.70	ug/ft²	< 2.7	ug/ft²	
0564293	RUHL-W-27	Furnace	Wipe	****	0.111	2.70	ug/ft²	9.2	ug/ft²	
0564294	RUHL-W-28	Furnace	Wipe	****	0.111	33.75	ug/ft²	35	ug/ft²	
0564295	RUHL-W-29	Furnace	Wipe	****	0.111	2.70	ug/ft²	11	ug/ft²	
0564296	RUHL-W-30	Furnace	Wipe	****	0.111	2.70	ug/ft²	9.7	ug/ft²	
0564297	RUHL-W-31	Furnace	Wipe	****	0.111	2.70	ug/ft²	< 2.7	ug/ft²	
0564298	RUHL-W-32	Furnace	Wipe	****	0.111	2.70	ug/ft²	3.8	ug/ft²	
0564299	RUHL-W-33	Furnace	Wipe	****	0.111	2.70	ug/ft²	< 2.7	ug/ft²	
0564300	RUHL-W-34	Furnace	Wipe	****	0.111	2.70	ug/ft²	< 2.7	ug/ft²	
0564301	RUHL-W-35	Furnace	Wipe	****	0.111	2.70	ug/ft²	4.3	ug/ft²	
0564302	RUHL-W-36	Furnace	Wipe	****	0.111	2.70	ug/ft²	15	ug/ft²	
0564303	RUHL-W-37	Furnace	Wipe	****	0.111	2.70	ug/ft²	11	ug/ft²	

AMA Analytical Services, Inc.
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NVLAP 101143-0
NY ELAP 10920
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CERTIFICATE OF ANALYSIS

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Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Towson, MD	**Date Submitted:**	9/7/2005		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	Not Provided	**Date Analyzed:**	9/9/2005	**Report Date:**	09-Sep-05
Attention:	[redacted]						

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.
Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: [redacted] **chnical Manager:** [redacted]

APPENDIX E

LEAD CLEANING GUIDANCE

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CHAPTER 14: CLEANING

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Step-by-Step Summary

Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
3. Have sufficient cleaning equipment and supplies *before* beginning work.
4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
13. Paint or otherwise seal treated surfaces and interior floors.
14. Conduct a clearance examination (see Chapter 15).
15. If clearance is not achieved, repeat the final cleaning.

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Step-by-Step Summary (continued)

16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.
17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.
18. Cleaning equipment list:
    - HEPA vacuums.
    - Detergent.
    - Waterproof gloves.
    - Rags.
    - Sponges.
    - Mops.
    - Buckets.
    - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
    - 6-mil plastic bags.
    - Debris containers.
    - Waste water containers.
    - Shovels.
    - Rakes.
    - Water-misting sprayers.
    - 6-mil polyethylene sheeting (or equivalent).

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Chapter 14: Cleaning

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris and dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove all leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

✓ Is the critical importance of cleaning in a hazard control project understood?

✓ Have all workers been trained and certified for hazard control work?

✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?

✓ Have cleaning equipment and materials been obtained?

✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?

✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?

✓ Are all workers properly protected during the cleaning processes (see Chapter 9)?

✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?

✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?

✓ Are the clearance criteria to be met fully understood?

✓ Have all appropriate surfaces been properly painted or otherwise sealed?

✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

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C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

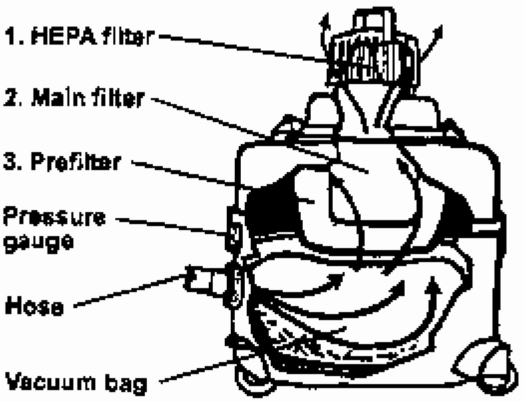
To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards and were properly seperated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and prefilter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the prefilter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

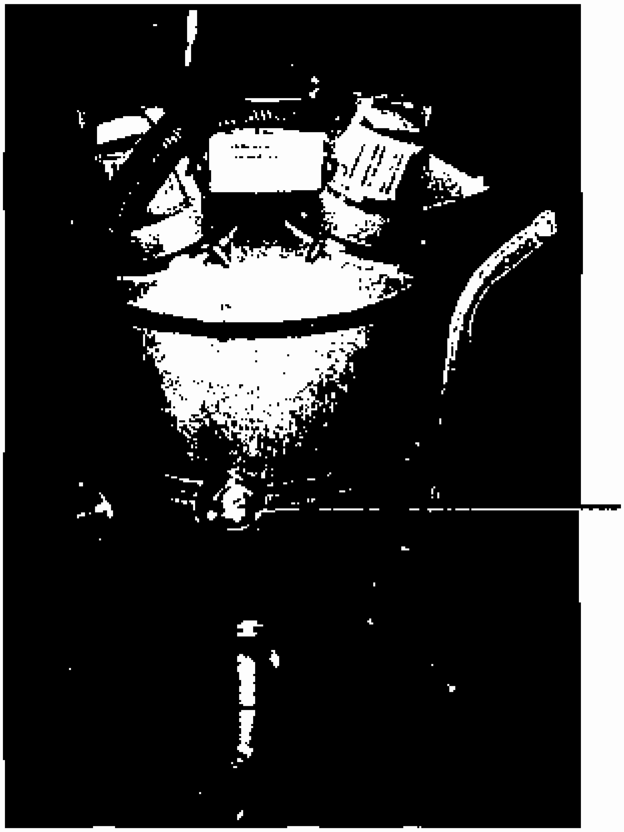
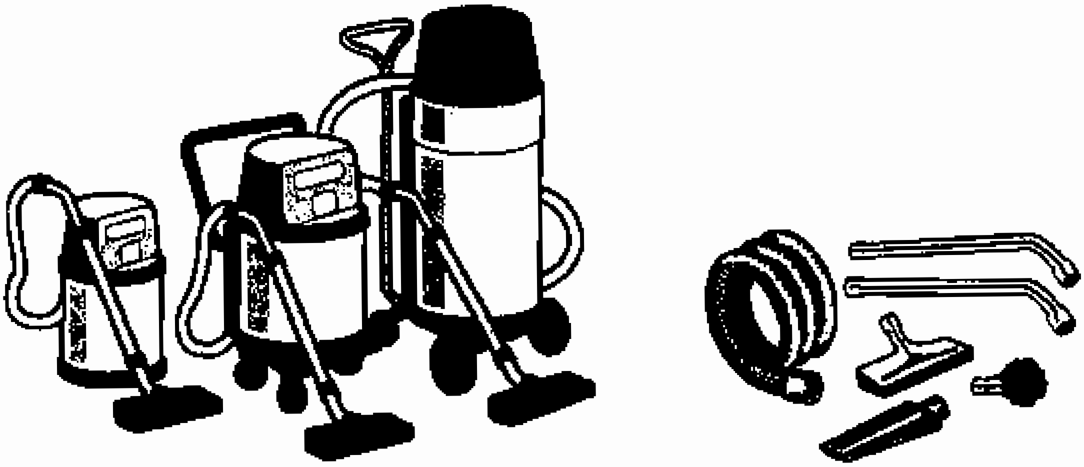


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

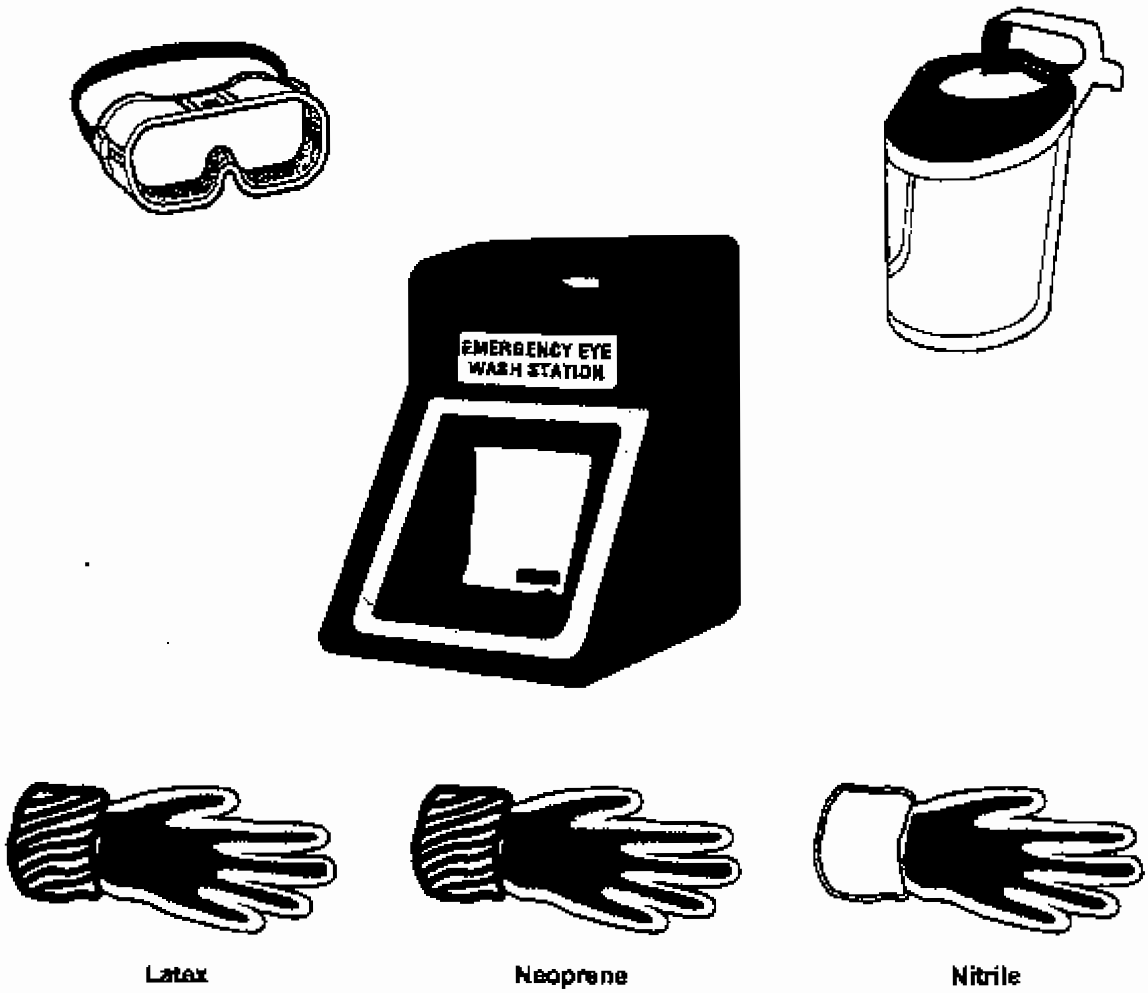
Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

- First, the area is HEPA vacuumed.

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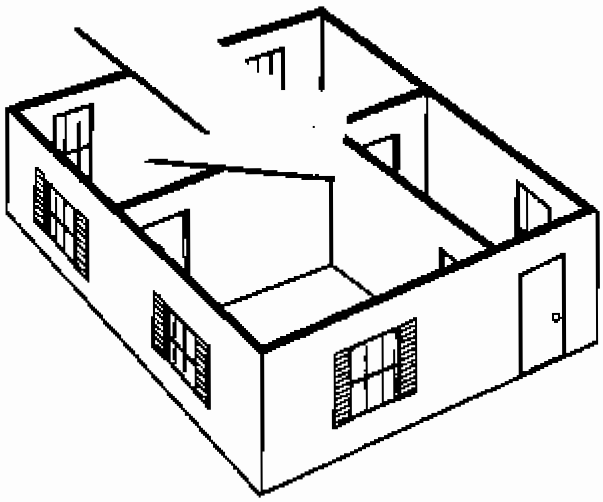
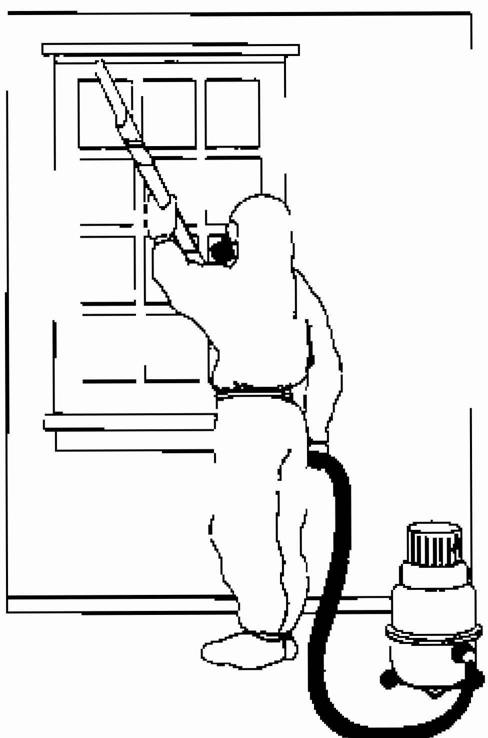
Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on, and work down to the floor. Do every inch of the windows, especially the window troughs.



Courtesy: Alice Hamilton Occupational Health Center

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- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

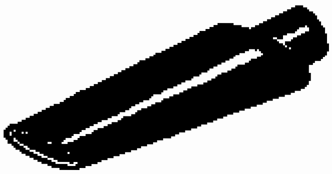
Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.



Rubber Cone

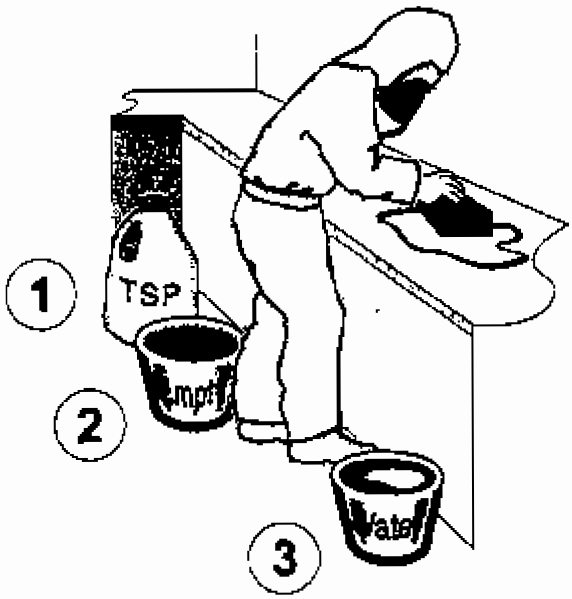
Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

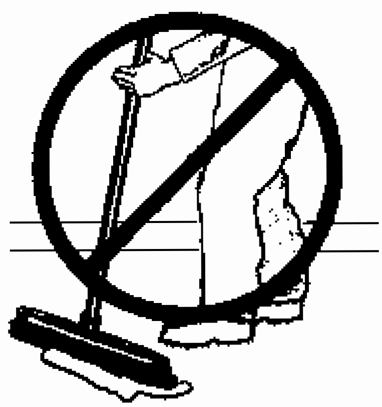
Figure 14.4c (continued)

Wash all surfaces with suitable detergents
Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces

Wet Mop Floor



Don't Dry Sweep

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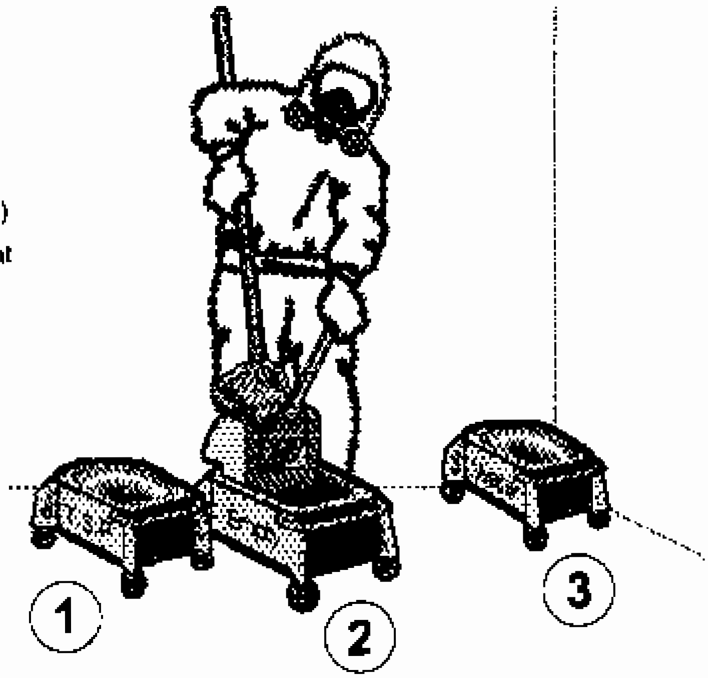
Figure 14.4c (continued)

Use the 3-Bucket System.

To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.



Squeeze out the mophead in empty bucket #2. Return to bucket #1 for more detergent solution and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

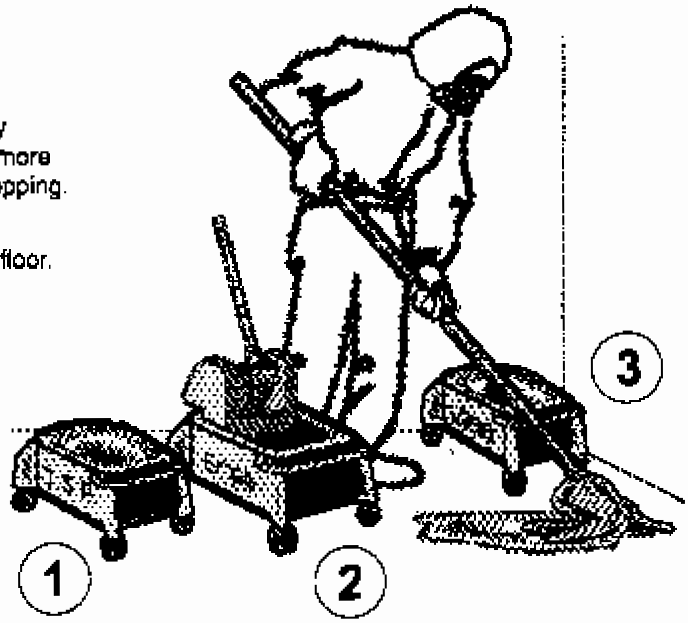
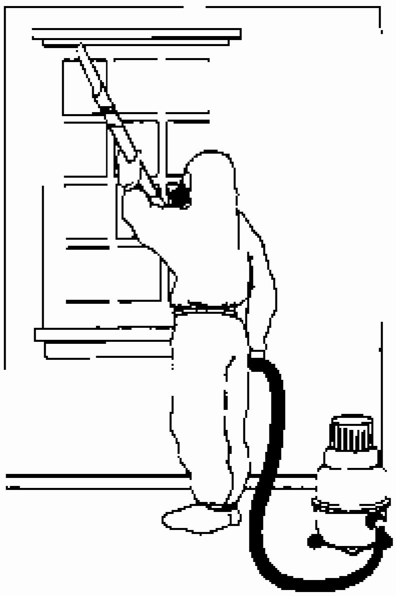


Figure 14.4d (continued)

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

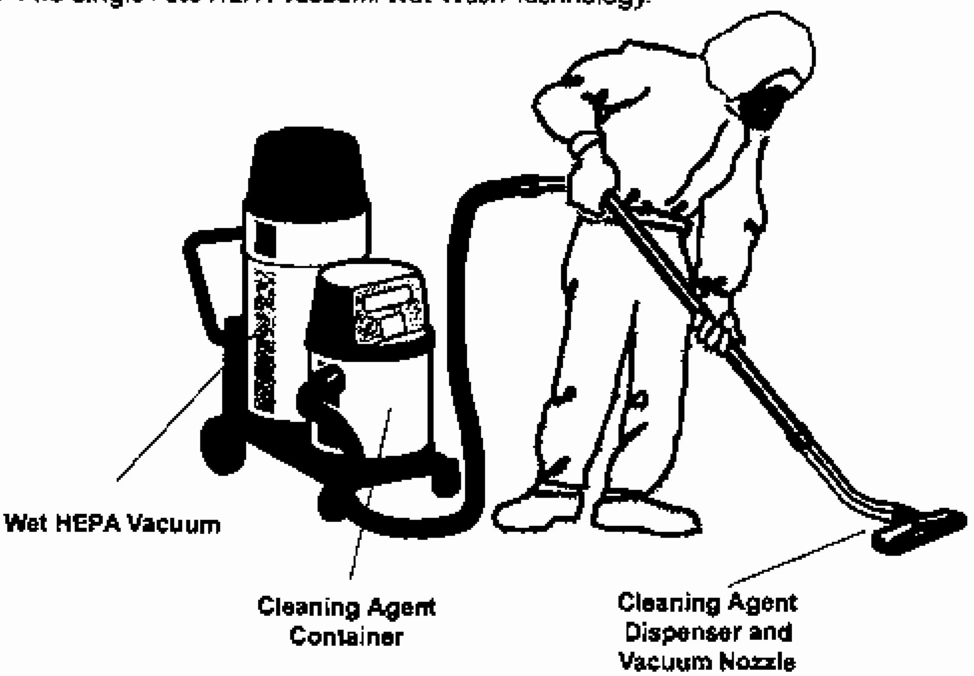
IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.



Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

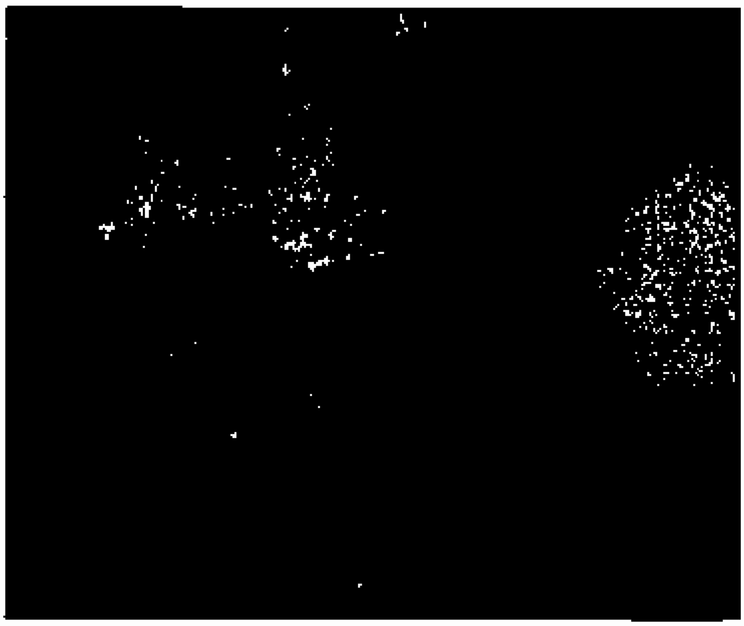


Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

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belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water and cleaned. All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

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the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).

Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This

option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dust-retaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table 14.1 Initial Cleaning Wipe-Test Failure Rates for Various Abatement Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.6%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)

and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993).

These *Guidelines* do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Cycle Number	Mass Removal Efficiency Percentages			
	Cleaning Method			
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.6	67.0	29.4
5	59.3	88.9	72.1	32.5
6	61.6	91.2	74.4	34.9
7	63.8	93.1	76.4	36.5
8	67.5	95.4	77.5	38.1
9	67.5	97.7	78.7	40.1
10	67.2	100.0	80.2	41.7
11		102.3	80.2	41.7
12		104.6	84.1	44.8
13		104.6	84.5	46.8
14		103.8	84.5	48.4
15				49.6
16				50.8
17				52.4
18				53.6
19				54.4
20				55.2

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) *Effectiveness of Clean-up Techniques for Leaded Paint Dust*

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Industrial Hygiene Study

National Guard Facility
Towson Ruhl Readiness Center
1035 York Road
Towson, MD 21204

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Towson Ruhl Readiness Center** **1035 York Road** **Towson, MD 21204**
Prepared By:	**Analytical Laboratory Services, Inc.** **3544 North Progress Avenue** **Suite 100** **Harrisburg, PA 17110**
Survey Date:	**June 10-11, 2010**
Report Date:	**July 22, 2010**
ALSI Project #:	**1006345**

Non-Responsive [redacted]

Director, Environmental Health & Safety

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted June 10-11, 2010, at the Towson Ruhl Readiness Center Facility located at 1035 York Road Towson, Maryland 21204. The survey was performed by Mr [redacted] CIH.

1. Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft^2 in Assembly/Drill Hall on the return vent of the HVAC system. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2.

2. Employees were not performing tasks that provided excessive noise levels, as such; noise exposure monitoring was not conducted.

3. Lighting levels met the minimum recommended guidelines in all locations except the Garage, Kitchen and Old Firing Range (storage). Lighting should be improved to meet the recommended guideline.

4. Indoor air quality parameters of temperature, relative humidity carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment. Temperature, relative humidity, carbon dioxide, and carbon monoxide levels were within parameters established by the Environmental Protection Agency (EPA) and American Society of Heating, Refrigerating, and Air-conditioning Engineers, Inc. (ASHRAE).

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Section 2.0 Operation Description & Observations

The Towson Ruhl Readiness Center primarily serves as an office setting and training center with vehicle and equipment storage areas. The facility consists of offices, classrooms, a drill hall, garage, and storage areas. There are approximately 25 full-time employees stationed at the facility. On drill weekends there can be many more occupants.

The Armory building was initially constructed in 1979. The training center was built in 1997. The exterior of the building is brick. The interior walls are primarily concrete block and drywall. The heating, ventilating, and air conditioning system (HVAC) consisted of boilers and roof top units. Outdoor air ventilation is provided via the roof-top units in some areas of the building. The ceilings were generally composed of a metal roof deck. Many areas were finished with a suspended drop ceiling system.

There is an old firing range in the building. It was closed in the 1970's and has been fully abated. It is used for storage. It is full of contents and was difficult to inspect.

Site personnel at the time of the site assessment consisted of approximately 25 administrative personnel. The employees on site were conducting general administrative work.

Overall housekeeping was good. Areas are clean and well kept.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared properly designed. Personnel had supportive chairs.

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Section 3.0 Noise Survey

Employees were not performing tasks that provided excessive noise levels. No noise exposure monitoring was not conducted.

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Section 4.0 Lead Testing

At the time of the assessment, no activities were observed which would generate lead exposure. Personnel reportedly clean rifles sometimes during drill weekends. The facility contains an unoccupied room which was once an indoor firing range. It is now a storage area.

Various surfaces within the facility were screened for lead using surface/wipe samples and the collection of air samples. Surface/wipe samples were collected using Ghost Wipe™ samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 um MCE cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2	Paint Chip %Pb
1	Drill Hall Classroom	<3.9		
2	Old Firing Range	<4.1		
3	Blank	<3 ug		
4	HVAC Supply Side		<110	
5	HVAC – Return Side		**360**	
6	Assembly Hall – Amnesty Box		<110	
7	Kitchen – Prep Table		<110	
8	HVAC Supply in Office		<110	
9	Old Firing Range - Floor		<110	
10	Old Firing Range Stored Items		<110	
11	Old Firing Range - Light Fixture		120	
12	Room 121 - Storage Cabinet		<110	
13	Room 204 - Desk		<110	
14	Room 206 – Desk		<110	
15	Blank		<12 ug	
16	Drill Hall Peeling Paint on Wall			<0.01
Criteria		**50**	**200**	**0.5**

Key: **Bolded** results exceed listed criteria

Surface levels of lead exceeded 200 ug/ft^2 in the sample collected from the return side of the HVAC system in the assembly hall.

The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for Environmental Chemicals," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 ug/m^3. In fact, no detectable levels of lead were identified in the air samples collected.

Deteriorated paint was observed in a few isolated areas throughout the facility most notable the men's locker room and the wall in the drill hall. Delaminated paint is most likely due to age along with prolonged exposure to elevated relative humidity levels. A paint chip sample was collected from the Assembly/Drill Hall wall where paint was peeling. No lead was detected in the sample collected. The result was less than the HUD definition of lead-based paint (0.5%).

Housekeeping and cleaning activities should be improved to maintain surface lead dust concentrations below 200 ug/ft^2. Emphasis should be placed on any areas where rifle cleaning is performed. Deteriorated and peeling paint should be properly remediated and repaired.

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Section 5.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. K070003). The light meter was last calibrated on November 26, 2009. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Old Firing Range (Storage)	**15.7**	30	No
Assembly Hall/Drill Floor	45	30-50	Yes
Kitchen	**46.7**	50	No
Drill Hall Classroom	67.9	30-50	Yes
Office 201	57.5	30-50	Yes
Conference Room 204	33.5	30-50	Yes
Office 203	49.8	30-50	Yes
Men's Latrine	26.8	5	Yes
Office 206	49.3	30-50	Yes
Fitness Center	36	30	Yes
Classroom 102	63.2	30-50	Yes
Classroom 118	58.5	30-50	Yes
Classroom 121	72.7	30-50	Yes
Garage Bays	**44**	75	No

Lighting levels met the minimum recommended guidelines in all locations except the Garage, Kitchen and Old Firing Range (storage). Lighting should be improved in these areas. It should be noted that the old firing range was so full of contents that it was difficult to collect measurements. Illuminance levels could be higher when contents are removed.

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Section 6.0 Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7565X (Serial # 0839020). The IAQ Meter was last calibrated in March 2010.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2007). ASHRAE specifics temperature and relative humidity ranges for human comfort (ASHRAE 55-2004). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60% in occupied areas.

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 73.6 to 77.8 degrees F with relative humidity readings ranging from 42.4% to 55.3%. During the survey, carbon dioxide (CO_2) levels ranged from 437 ppm to 843 ppm within the facility compared to an outdoor CO_2 level of 411 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,111 ppm (411 ppm + 700 ppm). The results of the testing met the ASHRAE guidelines. The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Old Firing Range (storage)	77	51.6	450	1.0
Drill Hall	76.9	48.6	443	0.6
Kitchen	77.7	45.3	452	0.4
Drill Hall Classroom	77.8	44.6	440	0.7
Office 201	75.7	42.6	843	0.6
Conference Room 204	74.2	42.4	437	0.6
Office 203	73.6	44.5	438	0.6
Office 206	75.9	50.8	478	0.2
Fitness Center	75.0	51.7	446	0.6
Classroom 102	74.5	54	495	0.5
Classroom 118	74.1	55.3	465	0.6
Classroom 121	74.2	41.7	511	1.2
Outdoors (Sunny & Warm)	82.3	38.8	411	0
Criteria	**73.0-79.0**	**30-60**	**<1,111**	**<9.0**

Key: **Bolded** results exceed listed criteria

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Temperature, relative humidity, carbon dioxide, and carbon monoxide levels were within recommended guidelines.

A visual inspection was conducted throughout visually accessible portions of the facility. The visual inspection was conducted to assess sources or pathways of factors potentially deleterious to IAQ. The roof-top units were inspected as much as possible. However, facility personnel could not open the units for inspection. It was reported that the air-conditioning was not working properly on the day of the survey. The visual inspection revealed the following items that may be potential sources of poor IAQ:

1. Supply vents were dirty in some areas. There were also some isolated areas of visible fungal growth on supply vents in a few locations. This is most likely due to condensation on the supply vent.

2. Water damage was observed in on the ceiling in Room 107. This is believed to be from a previous roof leak that has been repaired. No current water leaks were noted. A few water damaged ceiling tile were observed in the building.

All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced. Supply vents with suspected fungal growth should be cleaned. Do not permit dirt, debris, fungal growth, etc. to accumulate in any portion of the HVAC system including the supply and return vents.

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Section 7.0 Suspect Asbestos Containing Building Materials

No suspect asbestos containing materials (ACM) were observed at the time of this survey.

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Section 8.0 Maintenance Bay

There is a garage area present at this facility. The garage was formerly an FMS Shop but is no longer used for vehicle maintenance. It is a storage area for the recruiting office. There is local exhaust ventilation (LEV) present for vehicle exhaust. It was not apparent that any special clean up activity has been performed since it was converted to a parking/storage area.

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Section 9.0 Ventilation Assessment

The facility heating, ventilation, and air conditioning is provided by boilers and roof top units. At the time of this survey the air-conditioning was off and in need of repair. No other issues were identified with the mechanical system components.

In the garage area the LEV previously used for vehicle exhaust during maintenance was evaluated. The LEV from Bay 1 was severely damaged and could not be evaluated. The LEV in Bay 2 consisted of a flex duct with a 7.5" duct diameter. The flow rate was measured and found to be 536 Cubic Feet per Minute (CFM). This flow rate is less than the recommended parameters of the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation Manual; A Manual of Recommended Practice. The ACGIH recommends a total flow rate of 1,480 – 2,200 CFM.

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Section 10.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Analytical Laboratory Services, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A. Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP 10920

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	Towson Ruhl Armory	**Chain Of Custody:**	508092
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Towson, MD	**Date Submitted:**	6/15/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	NGB-IHNB	**Date Analyzed:**	6/22/2010 **Report Date:** 6/22/2010

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
1053494	1006345-1	Flame	Air	764	N/A	3.9	ug/m^3	<3	<3.9	ug/m^3	
1053495	1006345-2	Flame	Air	740	N/A	4.1	ug/m^3	<3	<4.1	ug/m^3	
1053496	1006345-3	Flame	Air Blank	0	N/A	3	ug/m^3		<3	ug	
1053497	1006345-4	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053498	1006345-5	Flame	Wipe	****	0.108	110	ug/ft^2	38	360	ug/ft^2	
1053499	1006345-6	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053500	1006345-7	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053501	1006345-8	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053502	1006345-9	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053503	1006345-10	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053504	1006345-11	Flame	Wipe	****	0.108	110	ug/ft^2	12	120	ug/ft^2	
1053505	1006345-12	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053506	1006345-13	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053507	1006345-14	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053508	1006345-15	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
1053509	1006345-16	Flame	Paint Chip	****	N/A	0.01	%Pb		<0.01	%Pb	

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP
10920

Client:	National Guard Bureau	**Job Name:**	Towson Ruhl Armory	**Chain Of Custody:**	508092
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Towson, MD	**Date Submitted:**	6/15/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted] Non-Responsive
		P.O. Number:	NGB-IHNE	**Date Analyzed:**	6/22/2010 **Report Date:** 6/22/2010
Attention:	[redacted] Non-Responsive				

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Total ug	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.
Air and Wipe results are not corrected for any blank results
Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.
All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accreditation applies only to paint chip, wipe, and soil samples.

Analyst: [redacted] Non-Responsive

Technical Manager: [redacted] Non-Responsive

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Page 1 of 2

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AMA Analytical Services, Inc.
Focused on Results   www.amalab.com
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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **508092**

P1/2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-4H Old Bay Lane
3. Address 2: Attn: NGB-AVN-SL State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273   Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Towson Ruhl Armory
2. Job Location: Towson, MD
3. Job #: Towson Ruhl Armory   P.O. #: W912K6-09-A-0003 NGB-IHAC
4. Contact Pers[redacted] Non-Respon
5. Submitted by [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ____ ☐ 24 Hours Time Due: ____ Comments: ____	☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day + Cobalt Date Due: ____ ☐ Results Required By Noon (Every Attempt Will Be Made to Accommodate)	☒ Include COC/Field Data Sheets with Report ☒ Email: jdunn@amalab.com ☐ Fax: shirley.chapman1@us.army.mil ☐ Verbals: ken.forsythe@us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____(QTY)
☐ Fiberglass ____(QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____(QTY)
☐ NIOSH 7402 ____(QTY)
☐ Other (specify ____) ____(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____(QTY)
☐ EPA Point Count ____(QTY)
☐ NY State Friable 198.1 ____(QTY)
☐ Grav. Reduction ELAP 198.6 ____(QTY)
☐ Other (specify ____) ____(QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM __(Qual) PLM __(Quan) PLM/TEM __(Qual) PLM/TEM __(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____(QTY)
☐ NY State PLM/TEM ____(QTY)
☐ Residual Ash ____(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____(QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____(QTY)
☐ Quan. (s/area) Dust D6480-99 ____(QTY)
TEM Water
☐ Qual. (pres/abs) ____(QTY)
☐ ELAP 198.2/EPA 100.2 ____(QTY)
☐ EPA 100.1 ____(QTY)

☒ All samples received in good condition unless otherwise noted.
TEM Water samples ____°C)

Metals Analysis
☒ Pb Paint Chip 1 ____(QTY)
☒ Pb Dust Wipe (wipe type Ghost) 12 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____(QTY)
☐ Pb TCLP ____(QTY)
☐ Drinking Water ☐ Pb ____(QTY) ☐ Cu ____(QTY) ☐ As ____(QTY)
☐ Waste Water ☐ Pb ____(QTY) ☐ Cu ____(QTY) ☐ As ____(QTY)
☐ Pb Furnace (Media ____) ____(QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
☐ Spore-Trap ____(QTY) ☐ Surface Vacuum Dust ____(QTY)
☐ Surface Swab ____(QTY) ☐ Culturable ID Genus (Media ____) ____(QTY)
☐ Surface Tape ____(QTY) ☐ Culturable ID Species (Media ____) ____(QTY)
☐ Other (Specify ____) ____(QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX** / **CLIENT CONTACT (LABORATORY STAFF ONLY)**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER/OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT
1006345-1	Drill Hall Closet	6/10	764					X		X							Date/Time: Contact: By:
1006345-2	Old Firing Range	↓	740					X		X							
1006345-3	Blank	↓	0					X		X							
1006345-4	HVAC-Supply	6/11		100cm²				X				X					
1006345-5	HVAC-Return							X				X					Date/Time: Contact: By:
1006345-6	Assembly Hall							X				X					
1006345-7	Kitchen-Prep							X				X					
1006345-8	HVAC-Supply							X				X					
1006345-9	Firing Range-Fl							X				X					Date/Time: Contact: By:
1006345-10	Firing Range-Stool							X				X					[redacted] Non-Responsive
1006345-11	Firing Range-Ashtray							X				X					
1006345-12	Range Cabinet	↓		↓				X				X					

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 6/15/10 @ 1000 Via: OPS By (Print) [redacted]
2. Date/Time Analyzed: ____/____/____ @ ____ By (Print) ____
3. Results Reported To: ____ Via: ____ Date: ____/____/____ Time: ____ Initials: ____
4. Comments: ____

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Page 2 of 2

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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 506092 P2/2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273   Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Towson Publ Armory
2. Job Location: Towson, MD
3. Job #: ____ P.O. #: W912K6-09-A-0003
4. Contact Person: [redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted] Signature:

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ____ ☐ 24 Hours Time Due: ____ Comments:	☐ Immediate ☐ 3 Day ☐ Results Required By Noon ☐ Next Day ☐ 5 Day + (Every Attempt Will Be ☐ 2 Day Date Due: ____ Made to Accomodate)	☒ Include COC/Field Data Sheets with Report ☒ Email: ____ @ ☐ Fax: shirley.chapman1@us.army.mil ☐ Verbal: ken.forsythe@us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
- ☐ NIOSH 7400 ____ (QTY)
- ☐ Fiberglass ____ (QTY)

TEM Air – Please Indicate Filter Type:
- ☐ AHERA ____ (QTY)
- ☐ NIOSH 7402 ____ (QTY)
- ☐ Other (specify ____) ____ (QTY)

PLM Bulk
- ☐ EPA 600 – Visual Estimate ____ (QTY)
- ☐ EPA Point Count ____ (QTY)
- ☐ NY State Friable 198.1 ____ (QTY)
- ☐ Grav. Reduction ELAP 198.6 ____ (QTY)
- ☐ Other (specify ____) ____ (QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM __(Qual) PLM __(Quan) PLM/TEM __(Qual) PLM/TEM __(Quan)

TEM Bulk
- ☐ ELAP 198.4/Chatfield ____ (QTY)
- ☐ NY State PLM/TEM ____ (QTY)
- ☐ Residual Ash ____ (QTY)

TEM Dust
- ☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
- ☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
- ☐ Quan. (s/area) Dust D6480-99 ____ (QTY)

TEM Water
- ☐ Qual. (pres/abs) ____ (QTY)
- ☐ ELAP 198.2/EPA 100.2 ____ (QTY)
- ☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis:
- ☐ Pb Paint Chip ____ (QTY)
- ☐ Pb Dust Wipe (wipe type ____) ____ (QTY)
- ☐ Pb Air ____ (QTY)
- ☐ Pb Soil/Solid ____ (QTY)
- ☐ Pb TCLP ____ (QTY)
- ☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
- ☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
- ☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
- ☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
- ☐ Other (Specify ____) ____ (QTY)

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER	SOIL	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
1006345-13	Rm 204 Desk	6-11		100 cm²				X				X					Date/Time: Contact: By:
1006345-14	Rm 206 Desk	↓		↓				X				X					
1006345-15	Blank							X				X					
1006345-16	Drill Hall Wall							X			X						
																	Date/Time: Contact: By:
																	Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: ___/___/___ @ ___ Via: ____ By (Print): ____ Sign: ____
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ___/___/___ Time: ____ Initials: ____
4. Comments: ____

Appendix B. Photographs

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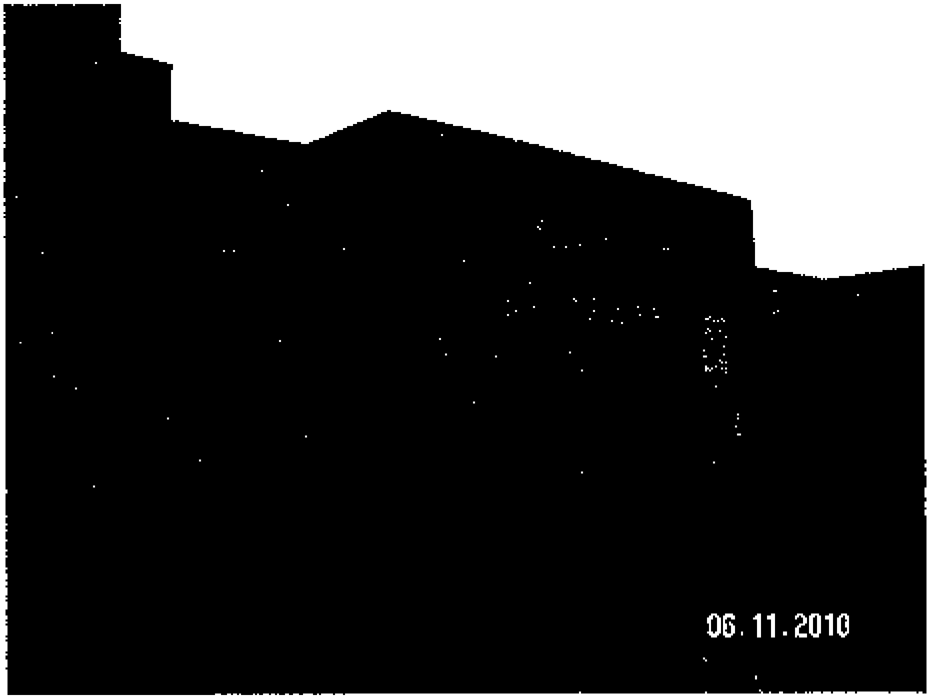
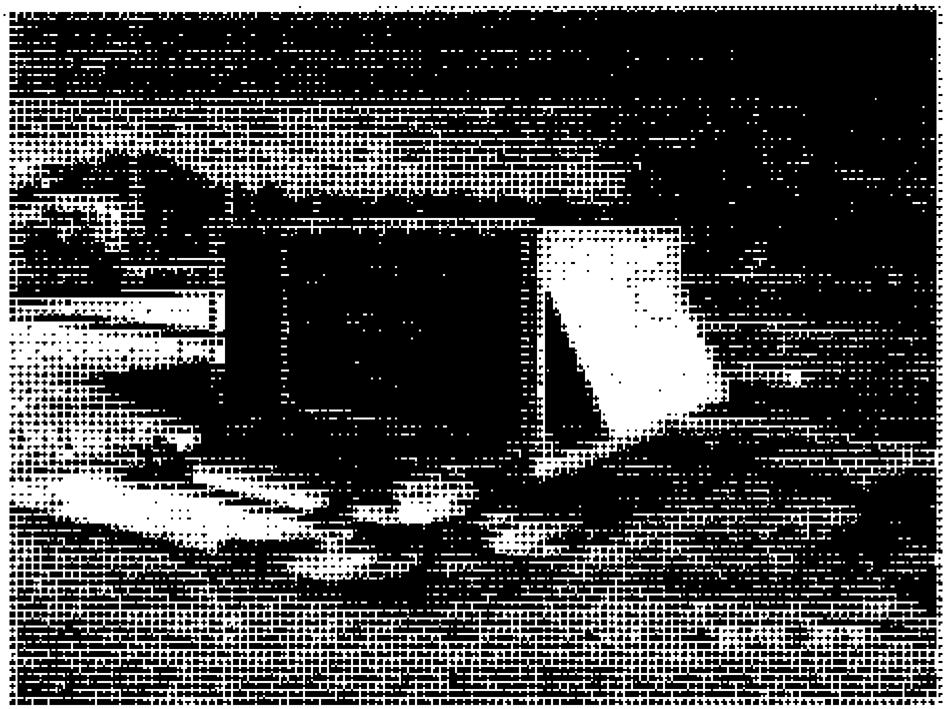
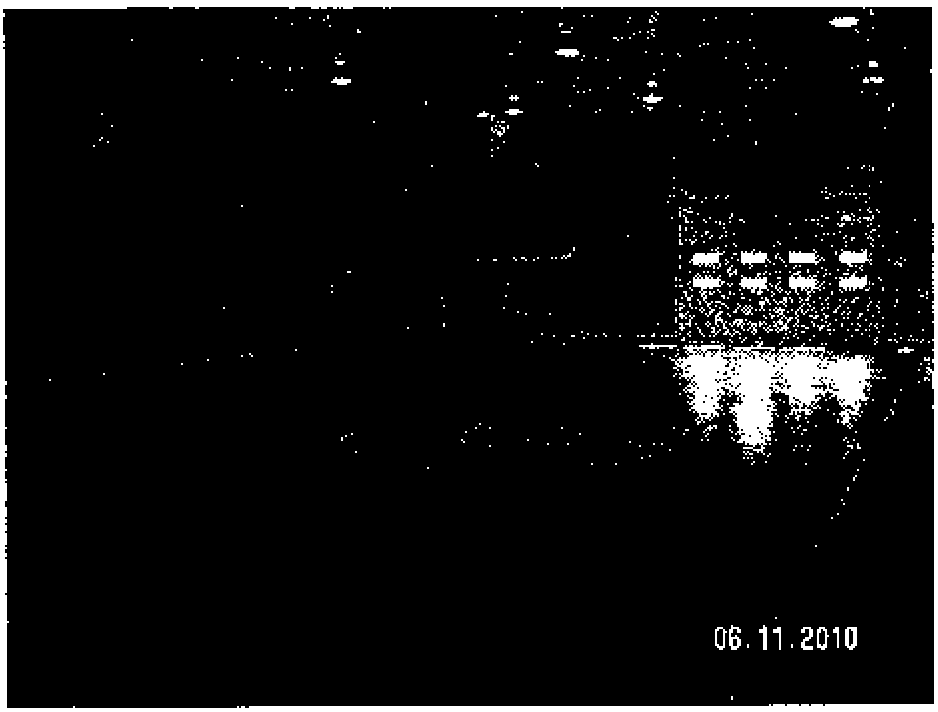


Exterior of Facility.



[illegible]



Drill Hall.

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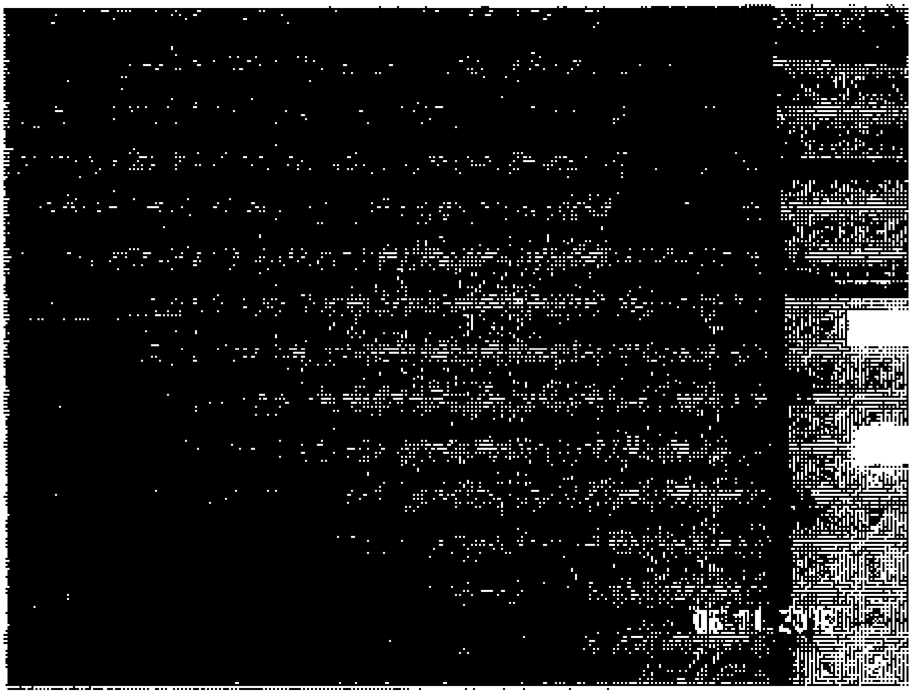
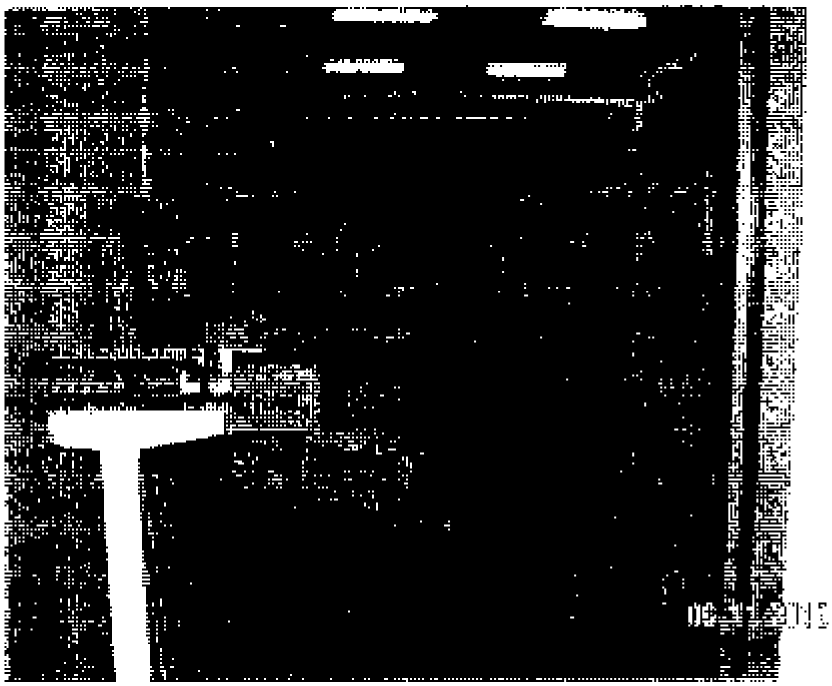
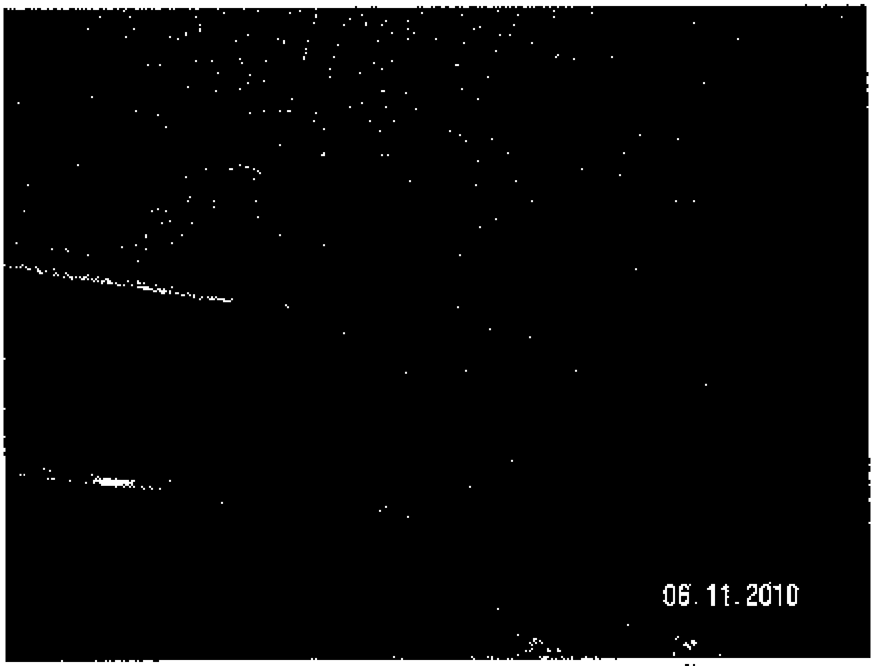


Drill Hall, Peeling Paint.



Old Firing Range.



Room 107, Water Damaged Ceiling Tile.

Men's Latrine, Peeling Paint.

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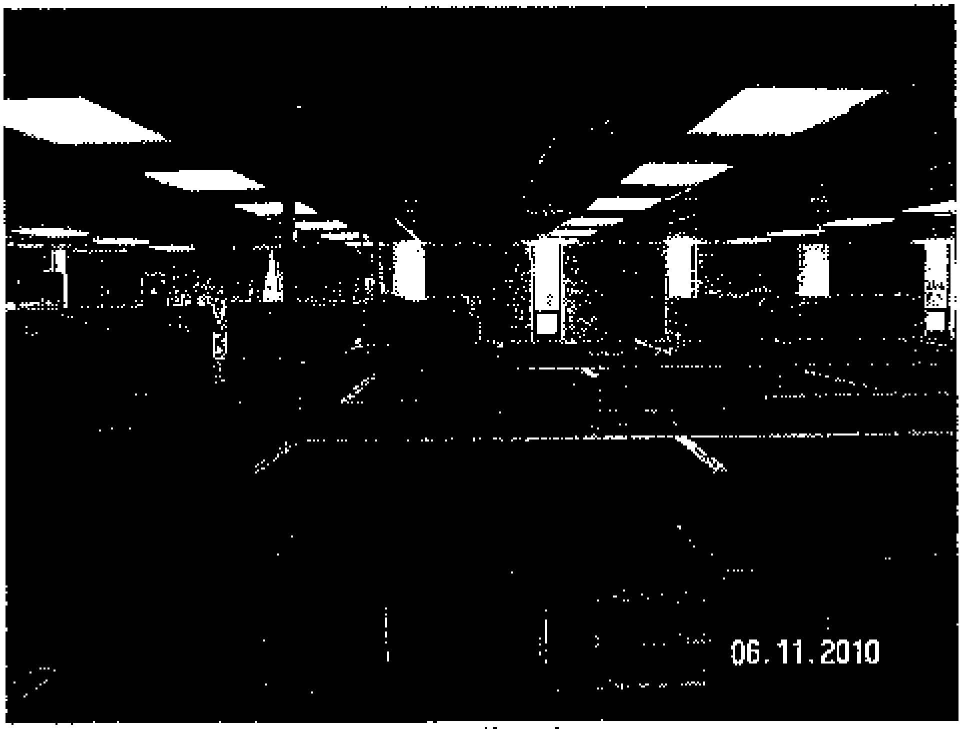
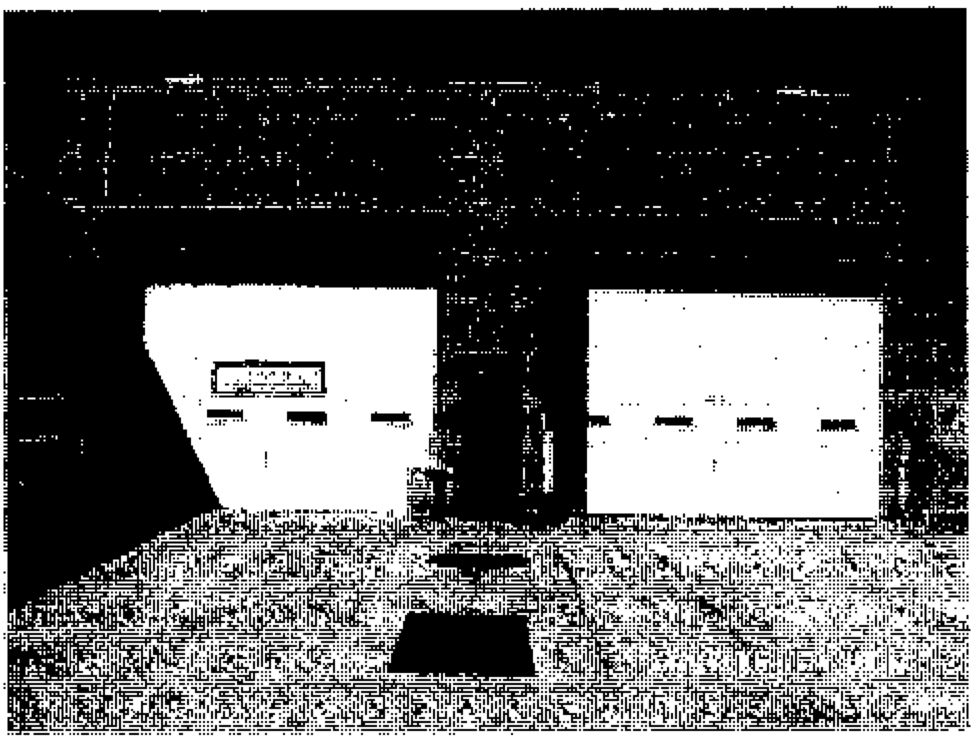
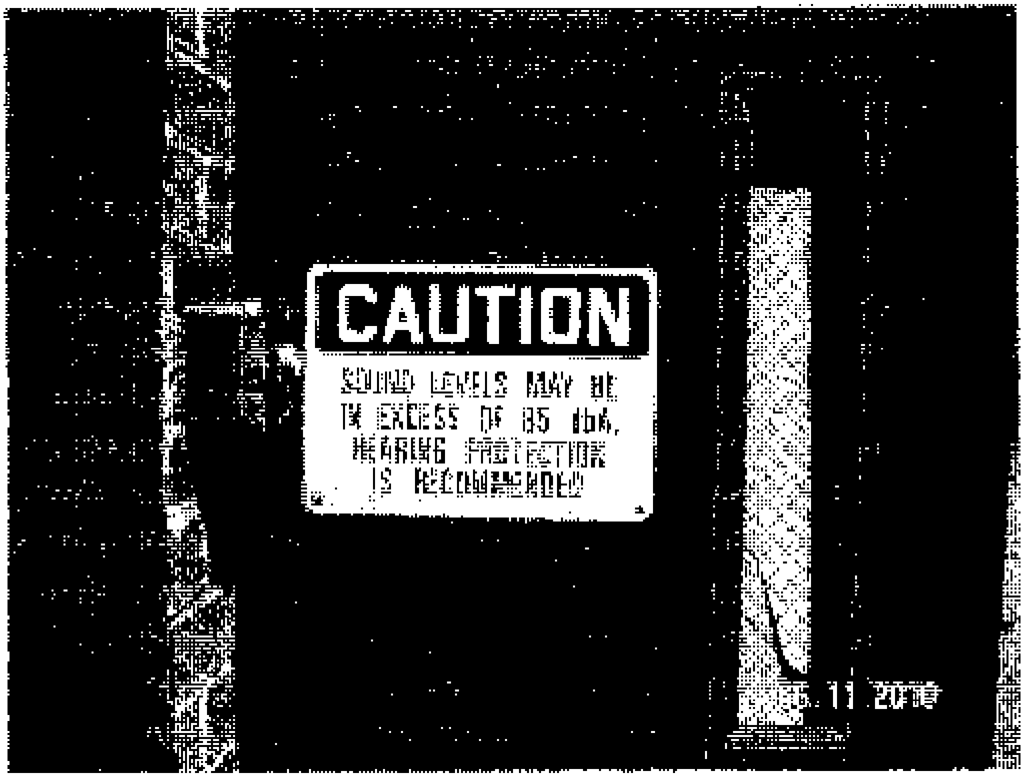
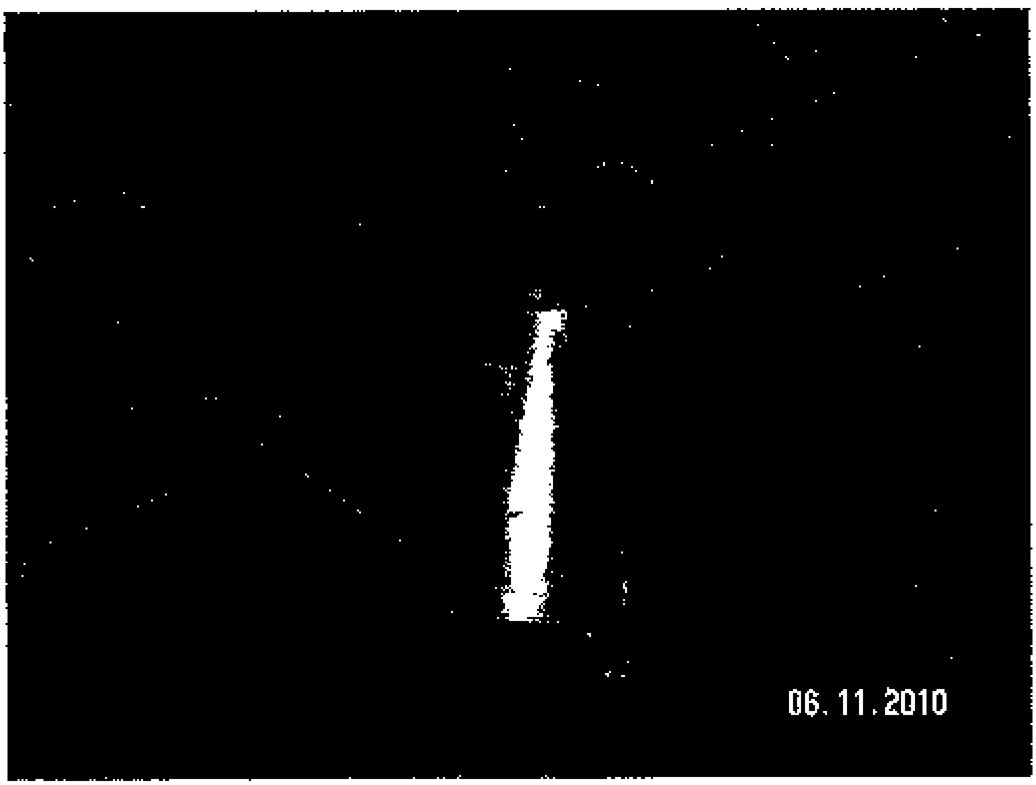


Typical Office Area.

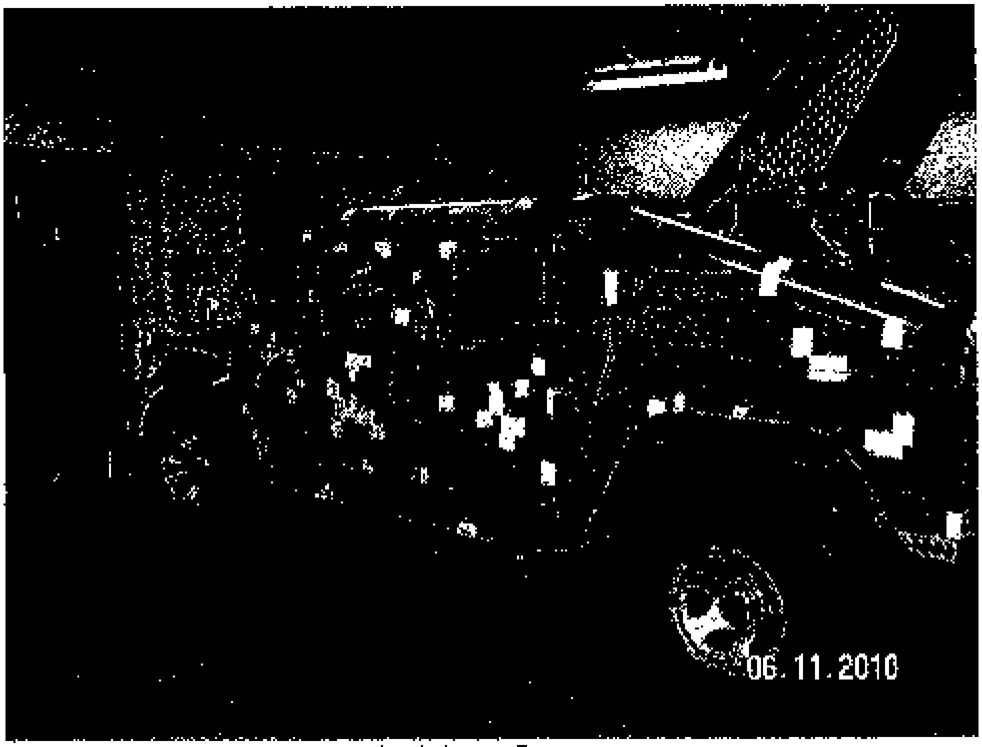

Exterior, Garage Doors.



MP Serine on Garage.



Damaged LEU in garage.



Vehicle in Garage.

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Appendix C. Floor Plan

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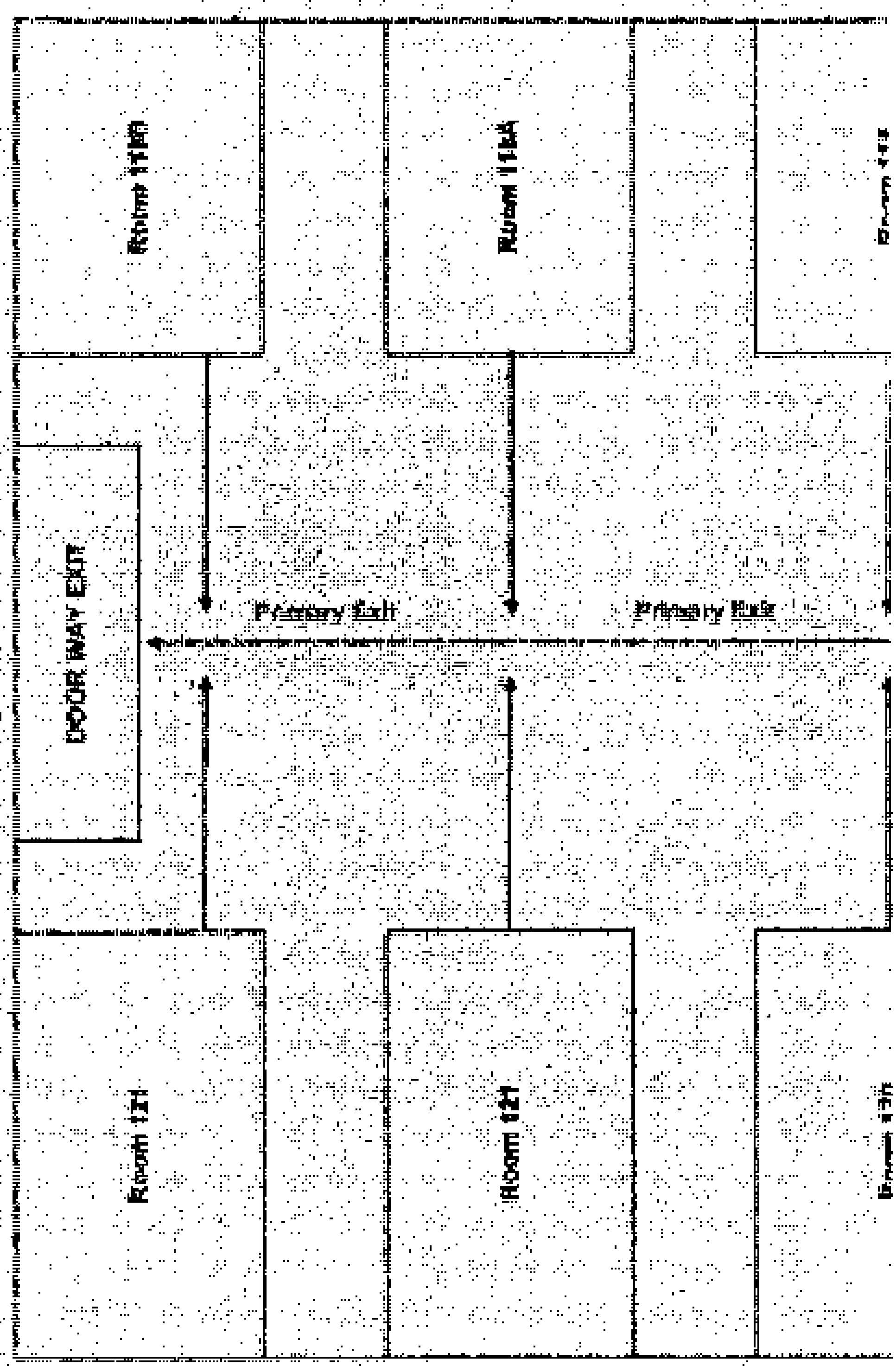
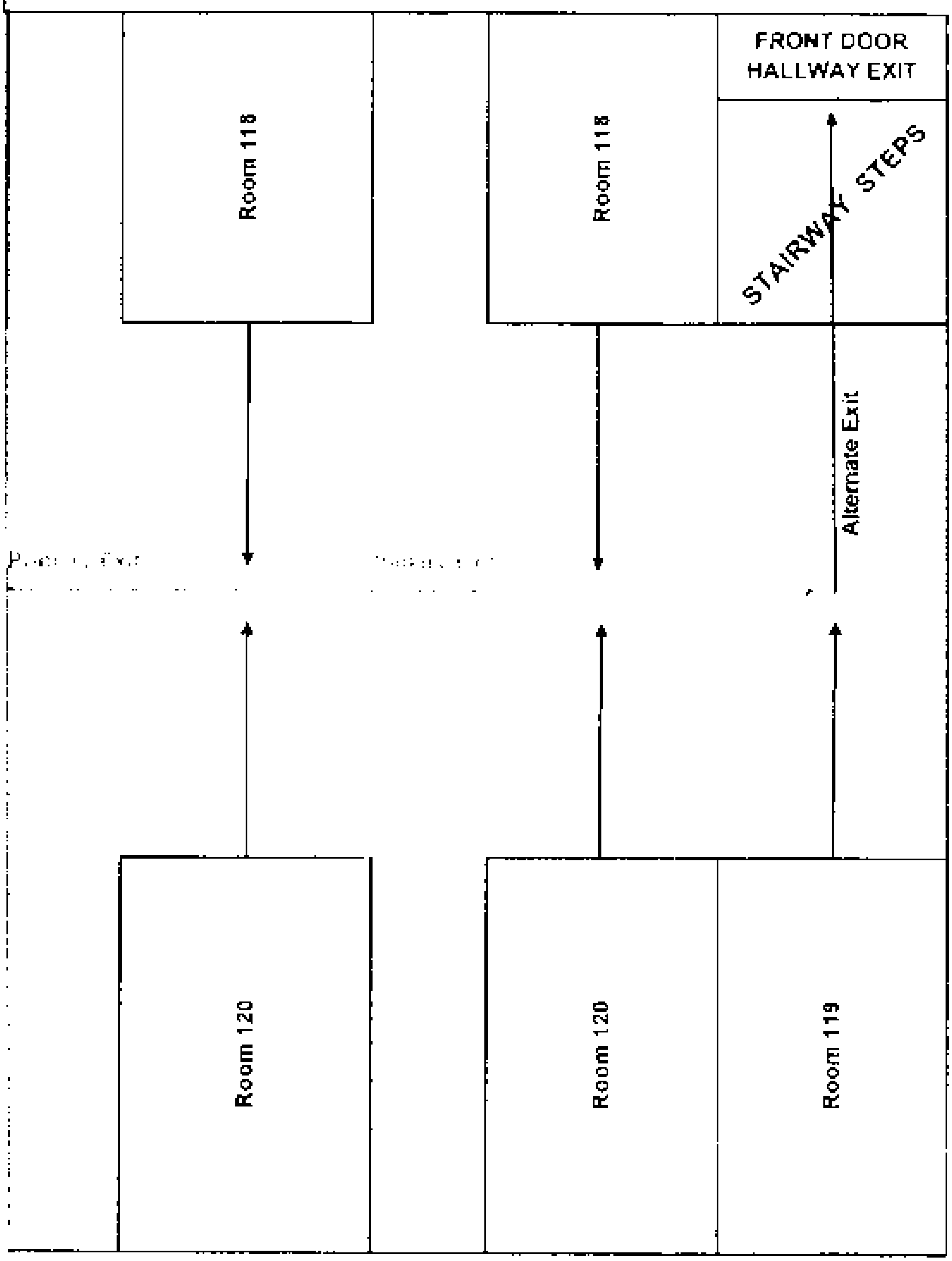
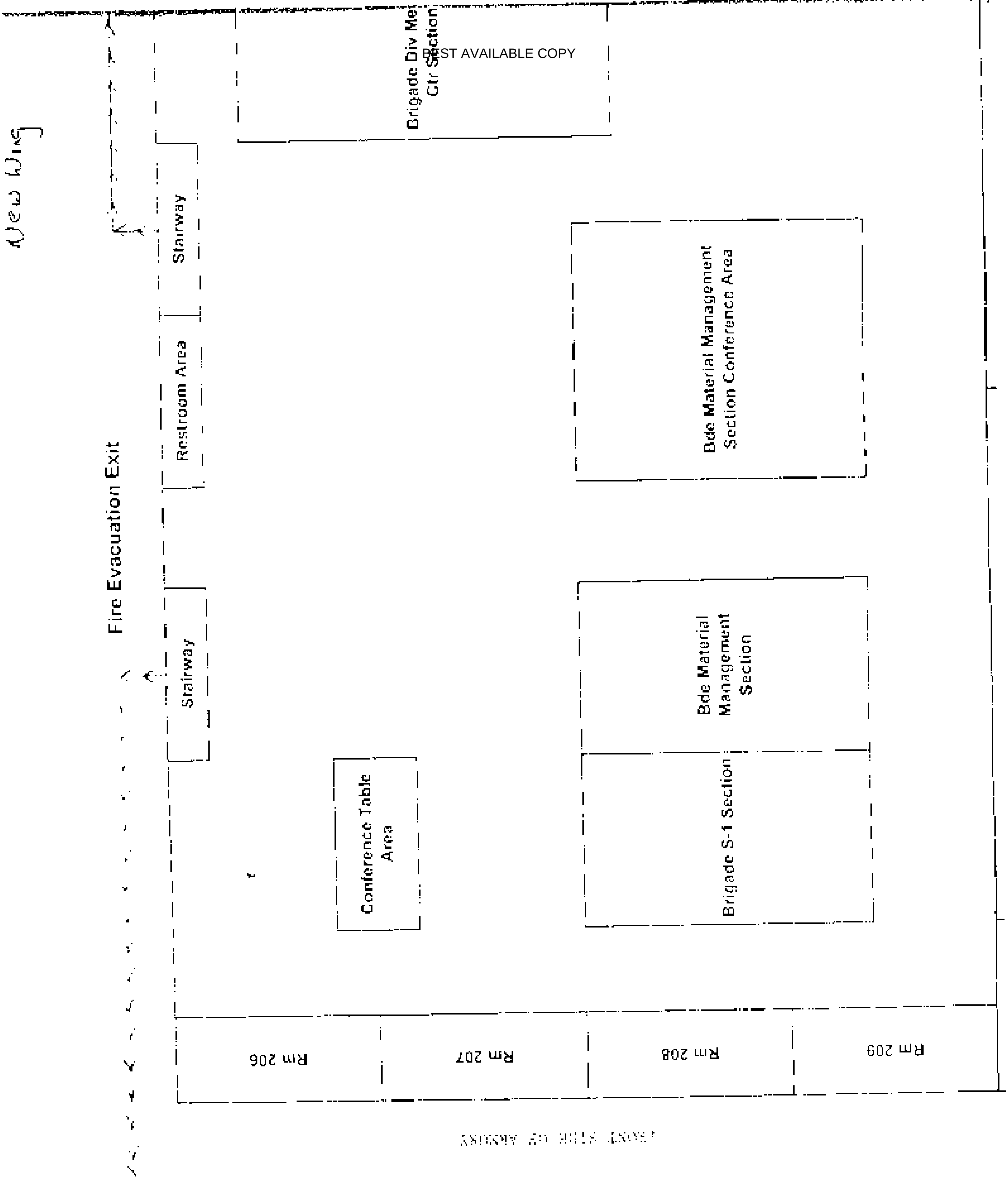
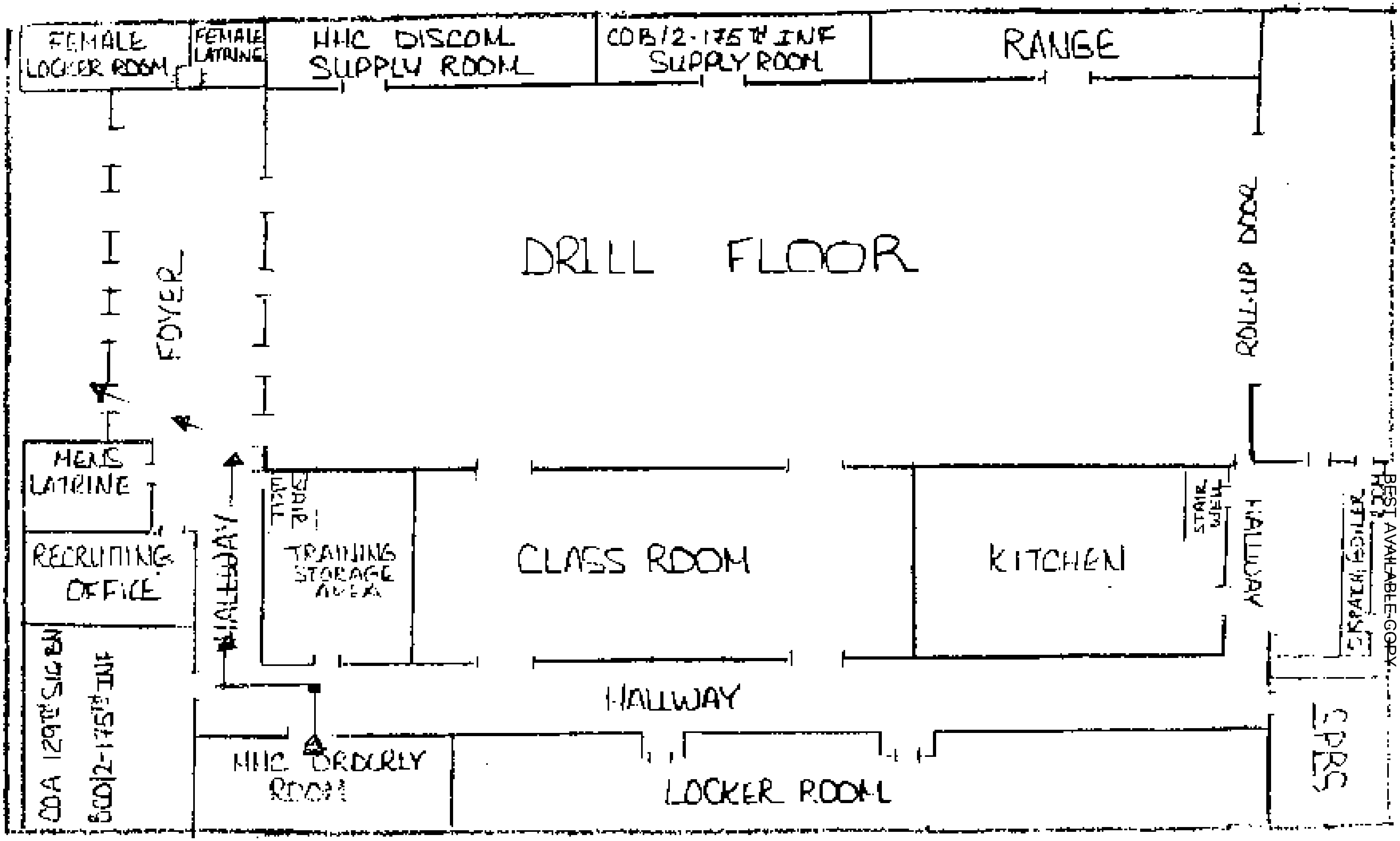
Fire Evacuatio



Fire Evacuation Exit




Brigade Div Me
Ctr Section
New Wing
Stairway
Restroom Area
Fire Evacuation Exit
Stairway
Bde Material Management
Section Conference Area
Bde Material
Management
Section
Brigade S-1 Section
Conference Table
Area
Rm 206
Rm 207
Rm 208
Rm 209



FIRE EVACUATION PLAN
1st FLOOR

Appendix D. References

1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead

2. American Conference of Governmental Industrial Hygienists (ACGIH) -- Threshold Limit Values and Biological Exposure Indices, 2010 Edition

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 25th Edition

4. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007

5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

7. National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

8. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h)(3)]

9. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

10. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation

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COMPLIANCE MANAGEMENT INTERNATIONAL

1215 Manor Drive, Suite 205
Mechanicsburg, PA 17055
Phone: 717.590.7031
Fax: 717.590.7936
www.complianceplace.com

Industrial Hygiene Survey Report

National Guard Facility
Towson Readiness Center

Prepared For:	**National Guard Bureau Region North** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Towson Readiness Center** **1035 York Road** **Towson, MD 21204**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**December 20, 2012**
Report Date:	**January 28, 2013**

Non-Responsive [redacted]

Senior Industrial Hygienist

Table of Contents

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on December 20, 2012, at the Towson Readiness Center located at 1035 York Road, Towson, MD 21204. The survey was performed by Mr. [redacted].

1. Surface, bulk and air samples for lead were collected. Surface levels of lead exceeded 200 micrograms per square foot (ug/ft^2) in one location. Cleaning procedures should be improved and remedial action should be taken to maintain lead levels below 200 ug/ft^2. See Section 3.0 for sampling results.

2. Lighting levels did not meet the American National Standard Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in the Exercise Room, and the 629th Commander's Office. See Section 4.0 for detailed findings.

3. Indoor air quality (IAQ) parameters were measured as part of this survey. Relative humidity was less than the recommended guideline in many of the areas. See Section 5.0 for sampling results.

4. Several conditions or factors that could affect indoor air quality were observed at the time of this survey. This includes:

    a. Roof leaks and sources of water infiltration;
    b. Dirty supply and return vents.

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Section 2.0 Operation Description & Observations

The Towson Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, attached garages and storage areas. There were approximately 30 full-time employees stationed at this facility at the time of this survey.

The building is two stories with a brick exterior. The original construction date was not known. There have been some renovations since its construction. The building has a flat rubber roof with stones. The interior walls are concrete block. The floors are concrete with vinyl floor tile or carpet.

The garages are used as vehicle storage areas. No maintenance or repairs are performed in these areas. Access to the garages was restricted.

There is a hot water heating system and five roof top air conditioning units.

The firing range has been converted into a Physical Fitness/Exercise room. No firing range components remain.

There is no child-care facility in the building.

Overall housekeeping practices were adequate.

No ergonomic concerns were reported.

Section 3.0 Lead Testing

Due to the age of the building there is the potential for lead based paint to be present. Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 um mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Bulk (%)	Air ug/m^3	Surface ug/ft^2
1	Orderly Room	*	<6.1	*
2	Drill Hall – Center	*	<5.5	*
3	Blank	*	<3	*
4	Drill Hall Floor	*	*	<110
5	Drill Hall Top of HVAC	*	*	160
6	Kitchen – Top of Freezer	*	*	<110
7	S – 1 Offices Supply Vent	*	*	<110
8	Converted Firing Range - Floor	*	*	<110
9	Converted firing Range - Contents	*	*	<110
10	Converted Firing Range – Light Fixture	*	*	**1900**
11	Entrance to Converted Firing Range – Floor	*	*	<110
12	Classrooms Main Hallway	*	*	<110
13	Classroom 120	*	*	<110
14	29th Rear Detachment Conference Room	*	*	<110
15	29th Rear Detachment Office 202C	*	*	<110
16	Command Section 213 Top of Cabinet	*	*	<110
17	Command Section J. Funk Station	*	*	<110
18	Command Section Col. Office	*	*	<110
19	29th Supply Office - Bookshelf	*	*	<110
20	29th Supply Area – Metal Shelf	*	*	<110
21	HHC Storage – Top of Cabinet	*	*	<110
22	HHC Office – Top of Cabinet	*	*	<110
23	629th Office – Desk	*	*	<110
24	Large Room off HHC – Top of Cabinet	*	*	<110
25	Drill Hall – South Wall	<0.01	*	*
-	Criteria	0.5	50	200

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million

3. **ug/ft^2 =** micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Source: NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges.

The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 “Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges” as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Bulk, surface and air samples for lead were collected. The following is a summary of the sample results from this survey.

- Surface levels of lead were at or above the recommended guideline of 200 ug/ft^2 in the: Converted Indoor Firing Range on the Light Fixture

  Cleaning procedures should be improved to maintain lead levels on surfaces below the recommended guideline of 200 ug/ft^2.

- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 ug/m^3.

- Paint was observed to be peeling in the Drill Hall on the east wall. A bulk sample was collected and determined to contain <0.01% Pb. This is less than the EPA definition of lead based paint = 0.5%. However, all areas of peeling paint should be repaired.

Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. K98364). The light meter was last calibrated in April 2012. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Food Services-Dining	51	10	Yes
Classroom 120	62	30 – 50	Yes
Classroom 118	60	30 – 50	Yes
Command Section Offices (Open Plan)	52	30 – 50	Yes
Command Section Office 208	80	30 – 50	Yes
Command Section Office 209	70	30 – 50	Yes
Command Section Office 210	114	30 – 50	Yes
Command Section Office 207	56	30 – 50	Yes
Command Section Office 206	81	30 – 50	Yes
Legal Office	35	30 – 50	Yes
Office 101	80	30 – 50	Yes
Food Services - Kitchen	60	50	Yes
Armory/Assembly - Drill Hall	35	10	Yes
29th Supply Office	69	30 – 50	Yes
29th Supply Storage	30	30	Yes
Lobby	50	10	Yes
Physical Fitness/Exercise	15	30	**No**
Women Latrine/Locker Room	18	5	Yes
29th Offices	85	30 – 50	Yes
29th Rear Detachment Office 204A	83	30 – 50	Yes
29th Rear Detachment Conference Room	31	30 – 50	Yes
Conference Room off HHC	71	30 – 50	Yes
HHC Offices (Open Plan)	56	30 – 50	Yes
HHC Storage	33	30	Yes
Command Office	45	30 – 50	Yes
629th Open Offices	35	30 – 50	Yes
629th Commander's Office	15	30 – 50	**No**

Table Notes:

1. FC = Foot Candles
2. **Bolded** results did not meet listed criteria

Source: ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

The lighting level did not meet the minimum recommended guideline in the Exercise Room, and the 629th Commander's Office. Lighting should be improved in these areas.

Section 5.0 Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, carbon monoxide and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 8554 (Serial #02041015). The IAQ Meter was last calibrated in August 2012.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2010). ASHRAE specifies temperature and relative humidity ranges for human comfort (ASHRAE 55-2010). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60%.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	46.6	46.6	303	3.0
Food Services – Dining Area	70.7	**28.8**	591	3.1
Classroom 120	63.7	41.9	534	2.5
Classroom 118	67.1	38.9	558	2.8
Command Section Offices	70.7	**28.1**	654	2.8
Office 208	71.2	**27.5**	672	2.6
Office 209	72.0	**28.6**	675	2.7
Office 210	72.3	**27.0**	675	2.6
Office 207	72.9	**27.5**	637	2.7
Office 206	72.7	**27.8**	663	2.7
Legal Office	72.3	**25.2**	555	2.6
Office 101	72.9	**24.5**	593	2.5
Food Services - Kitchen	71.4	**25.7**	515	2.5
Armory/Assembly-Drill Hall	68.9	**26.4**	490	2.6
29th Supply Office	66.9	37.3	510	2.5
29th Supply Storage	66.9	35.5	528	2.6
Lobby	66.0	**29.8**	488	2.6
Physical Fitness/Exercise Room	65.5	33.0	490	1.5
Women's Latrine	64.4	49.7	497	1.3
29th Offices	69.3	31.9	603	1.2
29th Rear Detachment Office 204A	70.7	30.0	615	1.3
29th Rear Detachment Conference	70.7	30.1	599	1.2

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
HHC Conference Room	68.7	**26.1**	531	1.5
HHC Offices	70.2	**25.1**	601	1.0
HHC Storage	65.8	**28.6**	456	1.5
Command Office	67.6	**25.6**	450	1.1
629th Offices	71.1	**28.8**	710	1.1
629th Commander's Office	61.0	31.7	386	1.1
Outdoors	46.9	46.5	306	1.0
Criteria	**68.0-79.0**	**30-60**	**<1,006**	**<9.0**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **F =** degrees Fahrenheit

Source: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010 & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature was <68°F in some areas (criteria of 68-79°F). However, many areas were not occupied during this survey. For comfort, maintain temperature levels between 68-79°F in occupied areas. Relative humidity was <30% (criteria of 30-60%) in many areas. Low relative humidity can cause the drying of the mucous tissues and an increased susceptibility to respiratory infection. Maintain relative humidity levels between 30-60%.

- Carbon dioxide levels measured did not exceed the recommended ceiling of 1,006 parts per million (ppm). This indicates that outdoor air ventilation is adequate in all areas.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm.

- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. The following observations were noted:

  - Numerous roof leaks and associated water damaged ceiling tile were present (e.g. Classroom 118, Physical Fitness/Exercise Room, Lobby, HHC Offices, and 29th Rear Detachment 202A Office). All sources of water infiltration should be identified and repaired. Water stained ceiling tile should be removed and replaced.

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- Overall housekeeping was adequate.
- The HVAC supply grills located in some areas were dirty. These should be cleaned. Do not permit dirt, debris, microbial growth, etc. to accumulate in any portion of the HVAC system.

Section 6.0 Suspect Asbestos Containing Building Materials

Because the age of the building was unknown, asbestos-containing materials (ACM) could be present in the facility. The following suspect asbestos-containing material was noted:

1. HVAC duct sealant in the Women's Latrine. This material was in good condition.

All suspect asbestos-containing material was observed to be intact and in good condition. Inaccessible areas such as behind walls or crawlspaces were not inspected. No bulk samples were collected.

Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI Q-Trak IAQ Meter	02041015	8/2012	NA
Cal Light 400 Light Meter	K98364	4/2012	NA
TSI 4100 Series Calibrator	6275	8/2012	NA
SKC Air Sampling Pump	647631	12/20/2012	1.98 LPM
SKC Air Sampling Pump	648349	12/20/2012	1.69 LPM

Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A. Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #100470

Client:	National Guard Bureau	**Job Name:**	NGB-Towson	**Chain Of Custody:**	514859
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	1035 York Road, Towson, MD	**Date Submitted:**	12/24/2012
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	12/27/2012 **Report Date:** 12/27/2012

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
13025542	1	Flame	Air	490	N/A	6.1	ug/m³	<3	<6.1	ug/m³	
13025543	2	Flame	Air	547	N/A	5.5	ug/m³	<3	<5.5	ug/m³	
13025544	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13025545	4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025546	5	Flame	Wipe	****	0.108	110	ug/ft²	18	160	ug/ft²	
13025547	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025548	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025549	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025550	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025551	10	Flame	Wipe	****	0.108	110	ug/ft²	210	1900	ug/ft²	
13025552	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025553	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025554	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025555	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025556	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025557	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025558	17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025559	18	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025560	19	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #100470

Client:	National Guard Bureau	**Job Name:**	NGB-Towson	**Chain Of Custody:**	514859
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	1035 York Road, Towson, MD	**Date Submitted:**	12/24/2012
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	Non-Responsive [redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	12/27/2012 **Report Date:** 12/28/2012

Attention: Non-Responsive [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
13025561	20	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025562	21	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025563	22	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025564	23	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025565	24	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025566	25	Flame	Paint Chip	****	N/A	0.01	%Pb		<0.01	%Pb	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B

N/A = Not Applicable   mg/Kg = parts per million (ppm) on a dry weight basis   mg/L = parts per million (ppm)

%Pb = percent lead on a dry weight basis   ug = micrograms   ug/L = parts per billion (ppb)

See QC Summary for analytical results of quality control samples associated with these samples.

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst: Non-Responsive [redacted]

Technical Manager: Non-Responsive [redacted]

OWI (410) 247-2024

159202

514859

1of3

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: NGB-TOWSON
2. Job Location: 1035 YORK RD TOWSON MD
3. Job #: [redacted] PO #: W912K6-09-A-0003
4. Contact Perso[redacted]
5. Submitted by: [redacted] ...gnature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☑ 5 Day + Date Due: 1/2/13
☐ 2 Day
☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ Email: dlarson @ complianceplace.com
☐ Fax: shirley.chapman1@us.army.mil
☐ Verbals: ken.forsythe@us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area)Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☑ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☑ Pb Paint Chip 1 (QTY)
☑ Pb Dust Wipe (wipe type GHOST WIPE 21 (QTY)
☑ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1.	ORDERLY ROOM	12/20/12	490					X								
2.	DRILL HALL CENTER		547													
3.	BLANK		0													
4.	DRILL HALL FLOOR			100cm²												
5.	DRILL HALL TOP OF HVAC															
6.	KITCHEN TOP OF FREEZER															
7.	S-1 SUPPLY OFFICE															
8.	CONV. FIRING RANGE FLOOR															
9.	CONTENT															
10.	LT. FIXTURE															
11.	OUTSIDE - FLOOR															
12.	CLASSROOMS MAIN HALL															

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY (CUSTODY)
1. Date/Time RCVD: 12 / 24 / 12 @ 0800 Via: FEDEX By (Prin[redacted] Sign[redacted]
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ____ / ____ / ____ Time: ____ Initials: ____
4. Comments: 7939 3322 9046

OWI (410) 247-2024 159202 210 REV. 6.08

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 514859

2 of 3

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: NGB - TOWSON
2. Job Location: 1035 YORK RD TOWSON MD
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person [redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled): ☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:

NORMAL BUSINESS HOURS: ☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day + Date Due: ☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

REPORT TO: ☒ Include [redacted] ts with Report ☒ Email: [redacted] @complianceplace.com ☐ Fax: [redacted] @us.army.mil ☐ Verbals: [redacted] @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 (QTY)
☐ Fiberglass (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA (QTY)
☐ NIOSH 7402 (QTY)
☐ Other (specify) (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate (QTY)
☐ EPA Point Count (QTY)
☐ NY State Friable 198.1 (QTY)
☐ Grav. Reduction ELAP 198.6 (QTY)
☐ Other (specify) (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield (QTY)
☐ NY State PLM/TEM (QTY)
☐ Residual Ash (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust (QTY)
☐ Quan. (s/area) Vacuum D5755-95 (QTY)
☐ Quan. (s/area)Dust D6480-99 (QTY)
TEM Water
☐ Qual. (pres/abs) (QTY)
☐ ELAP 198.2/EPA 100.2 (QTY)
☐ EPA 100.1 (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ___°C)

Metals Analysis
☒ Pb Paint Chip 1 (QTY)
☒ Pb Dust Wipe (wipe type GW) 21 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid (QTY)
☐ Pb TCLP (QTY)
☐ Drinking Water ☐ Pb (QTY) ☐ Cu (QTY) ☐ As (QTY)
☐ Waste Water ☐ Pb (QTY) ☐ Cu (QTY) ☐ As (QTY)
☐ Pb Furnace (Media) (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ Spore-Trap (QTY) ☐ Surface Vacuum Dust (QTY)
☐ Surface Swab (QTY) ☐ Culturable ID Genus (Media) (QTY)
☐ Surface Tape (QTY) ☐ Culturable ID Species (Media) (QTY)
☐ Other (Specify) (QTY)

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13. CLASSROOM	120	12/20/12		100cm²				X								
14. REAR DET	Conference Room															
15. REAR DET	OFFICE 202C															
16. COMMAND Section	213 Top CAB															
17. CMD SECTION	J. FUNK STATION															
18. CMD SECTION	Col. OFFICE															
19. 29TH Supply	OFFICE BKShelf															
20. 29TH supply	shelf															
21. HHC STORAGE	Top of CAB.															
22. HHC office	Top of CAB.															
23. 629TH OFFICE	DESK															
24. Lg. Room - HCC	Top of CAB.															

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY (CUSTODY)
1. Date/Time RCVD: / / @ Via: By (Print): Sign:
2. Date/Time Analyzed: / / @ By (Print): Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

OWI (410) 247-2024 159202 210 REV. 6.08

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 514859

3 of 3

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: NGB · Towson
2. Job Location: 1035 York Rd Towson MD
3. Job #: PO #: W912K6-09-A-0003
4. Contact Perso Non-Responsive @
5. Submitted by: Non-Responsive nature:

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day +
☐ 2 Day Date Due:
☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

REPORT TO:
☒ Include Non-Responsive with Report
☒ Email: Non-Responsive compliance place.com
☐ Fax: [redacted] @us.army.mil
☐ Verbals [redacted] @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 (QTY)
☐ Fiberglass (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA (QTY)
☐ NIOSH 7402 (QTY)
☐ Other (specify) (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate (QTY)
☐ EPA Point Count (QTY)
☐ NY State Friable 198.1 (QTY)
☐ Grav. Reduction ELAP 198.6 (QTY)
☐ Other (specify) (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield (QTY)
☐ NY State PLM/TEM (QTY)
☐ Residual Ash (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust (QTY)
☐ Quan. (s/area) Vacuum D5755-95 (QTY)
☐ Quan. (s/area)Dust D6480-99 (QTY)
TEM Water
☐ Qual. (pres/abs) (QTY)
☐ ELAP 198.2/EPA 100.2 (QTY)
☐ EPA 100.1 (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples °C)

Metals Analysis
☒ Pb Paint Chip 1 (QTY)
☒ Pb Dust Wipe (wipe type GW) 21 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid - (QTY)
☐ Pb TCLP (QTY)
☐ Drinking Water ☐ Pb (QTY) ☐ Cu (QTY) ☐ As (QTY)
☐ Waste Water ☐ Pb (QTY) ☐ Cu (QTY) ☐ As (QTY)
☐ Pb Furnace (Media) (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ Spore-Trap (QTY) ☐ Surface Vacuum Dust (QTY)
☐ Surface Swab (QTY) ☐ Culturable ID Genus (Media) (QTY)
☐ Surface Tape (QTY) ☐ Culturable ID Species (Media) (QTY)
☐ Other (Specify) (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
25. Drill Hall	South Wall	12/20/12						X			X					

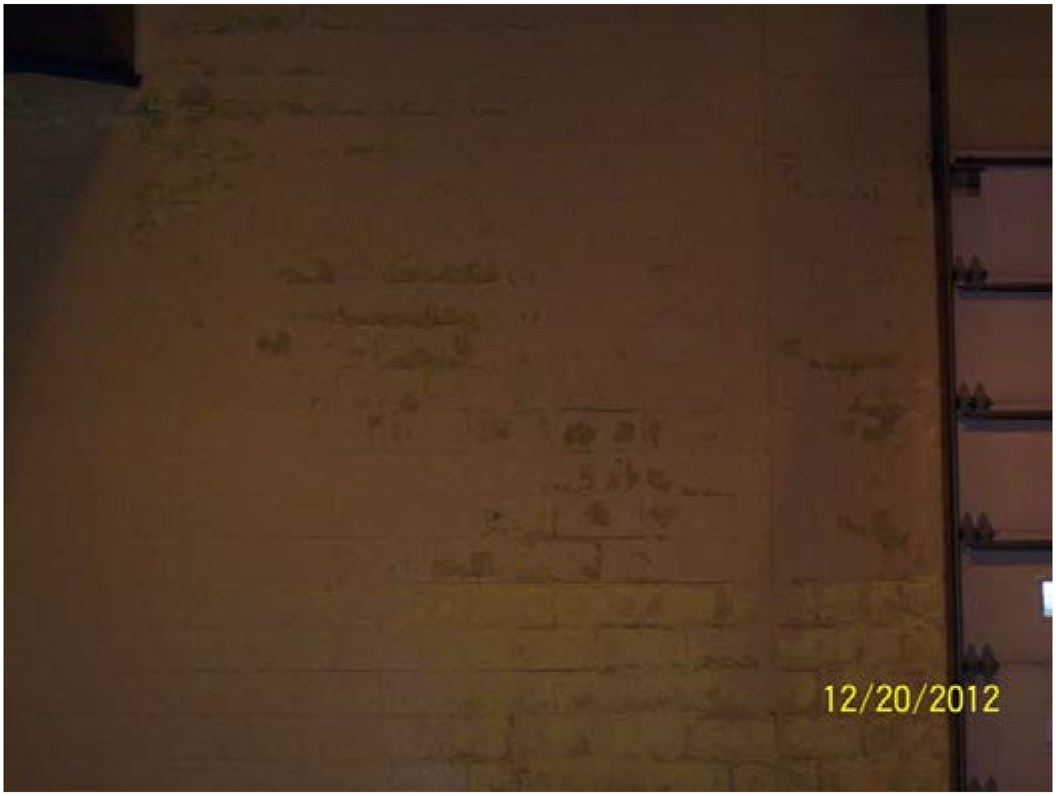
CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY (CUSTODY)
1. Date/Time RCVD: / / @ Via: By (Print): Sign:
2. Date/Time Analyzed: / / @ By (Print): Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

Appendix B. Photographs

ARNG Towson Armory Entrance

Drill Hall



Drill Hall South Wall Water Damage

Command Section Water Damage

Converted Firing Range

Exercise Water Damage

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HHC Water Damage

Legal Office Water Damage

Appendix C. Floor Plan

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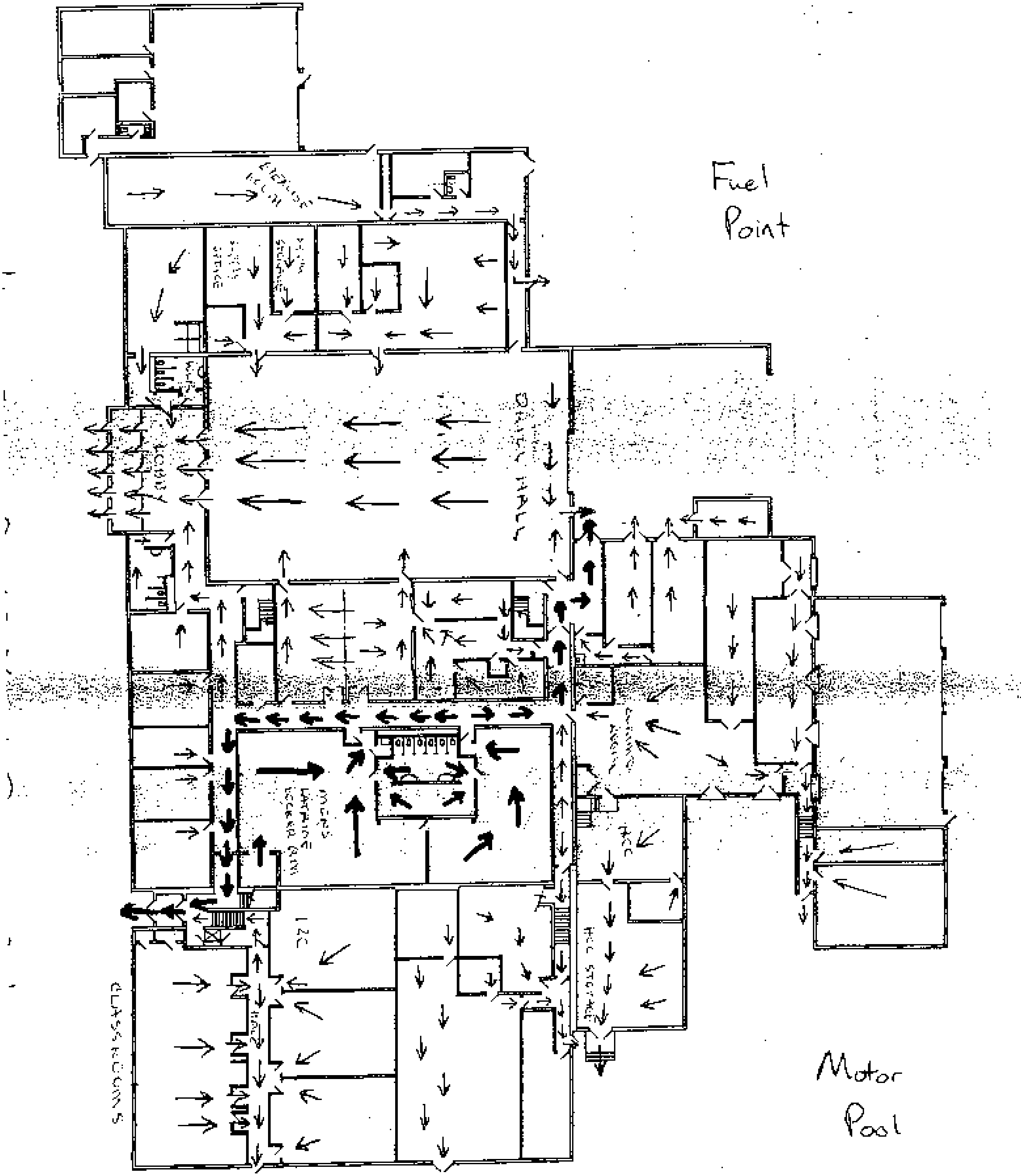
Fire Evacuation Plan



TOWSON RUHL FIRST FLOOR

Appendix D. References

1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead

2. American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2011 Edition

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition

4. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2010

5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/American National Standards Institute (ANSI)

7. National Emission Standard Hazardous Air Pollutants (NESHAP) – The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

8. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h)(3)]

9. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

10. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.

11. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 NOV 06.

12. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

REPLY TO
ATTENTION OF

MCHB-TS-OFS May 2004

MEMORANDUM FOR Army National Guard Bureau (NGB) Region North Industrial Hygiene NGB-AVS-SI-IH/[redacted], 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03 LTC E Leslie Medford Armory, Annapolis, MD

1. Enclosed is a copy of subject report and one CD-ROM.

2. Please direct any additional comments or concerns to Ms. [redacted], at DSN 584-5475/3118, commercial (410) 436-5475/3118 or e-mail address at [redacted]@apg.amedd.army.mil.

ENCL

[redacted]
Industrial Hygienist
Industrial Hygiene Field Services Program

Readiness thru Health

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U.S. Army Center for Health Promotion and Preventive Medicine

USACHPPM

MDARNG FACILITIES IH BASELINE SURVEY
LTC E LESLIE MEDFORD ARMORY
ANNAPOLIS, MD
55-ML-01ED-03

Approved for public release; distribution unlimited.

CHPPM FORM 432-E (MCHB-CS-IPD), OCT 03

Readiness Thru Health

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U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed $3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- ♦ *Integrity is the foundation*
- ♦ *Excellence is the standard*
- ♦ *Customer satisfaction is the focus*
- ♦ *Its people are the most valued resource*
- ♦ *Continuous quality improvement is its pathway*

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

CHPPM FORM 432-E (MCHB-CS-IPD), OCT 03 *(reverse)*

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

REPLY TO
ATTENTION OF

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS, ANNAPOLIS ARMORY
ANNAPOLIS, MD
PROJECT NO. 55-ML-01ED-03

1. PURPOSE OF EVALUATION. To conduct surveys at Army National Guard (ARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions at ARNG facilities. The survey will serve to establish a baseline so that a worker's history of exposures is provided for each civilian or military employee.

2. CONCLUSIONS.

a. Lead. All air sample results were below the laboratory analytical detection limit for lead in air of 0.005 to 0.006mg/m³ as well as the Occupational Health and Safety Administration (OSHA) standard of 50µg/m³ for lead in air. All three dust-lead wipe sample results were below the USACHPPM recommended decontamination level of 200µg/ft² for dust-lead on frequently contacted surfaces. However, two dust-lead wipe sample results in the locker room (the former indoor firing range) exceeded the EPA lead exposure level for children of 40µg/ft² on floors. There is a potential for personnel using the locker room to track dust-lead out of the area and redistribute it into adjacent rooms in the armory. This can result in lead exposures for children and for the general workforce. One of three deteriorated paint samples is lead-based paint. Deteriorated lead-based paint is hazardous to children. One additional sample was below the Environmental Protection Agency (EPA) definition of lead-based paint, but exceeded the laboratory analytical detection limits of 0.005 %. This sample is referred to as lead-contaminated paint, and is potentially hazardous to children. Army Regulation 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them. Recleaning the areas where dust-lead is present may further prevent exposures for children and for the general workforce.

b. Safety. The sidewalk outside the armory is buckling due to tree root growth. This presents a potential trip hazard for people using the sidewalk.

3. RECOMMENDATIONS. The Department of Defense Risk Assessment Codes (RAC) for Health Hazards enables one to prioritize remedial action for hazards. Risk Assessments Codes range in magnitude from 1 to 5, with 1 being the highest priority.

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a. The RAC for Lead Exposure in the former indoor firing range is classified as 5. Clean all areas in and adjacent to the former IFR where sampling results showed the presence of dust-lead. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. If children will continue to use this facility, clean surfaces to the EPA dust-lead standard for young children of 40µg/ft² on floors and clean to 200µg/ft² for dust-lead on all other surfaces. Recleaning may further prevent lead from becoming redistributed into adjacent rooms and resulting in exposures for children and for the general workforce. Repair and stabilize deteriorated paint. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities. These workers are required to be in compliance with the OSHA lead in construction standard 29 CFR 1926.62. There is a potential for personnel taking lead contamination out of the workplace into their vehicles and homes. Wear disposable gloves and disposable coveralls as extra protection when working in areas identified as having elevated levels of lead.

b. Safety. Address the problem of the concrete sidewalk buckling due to tree root growth. This presents a potential trip hazard for people using the sidewalk.

MDARNG Facilities IH Baseline Surveys, LTC E. Leslie Medford Armory Annapolis, MD
Project No. 55-ML-01ED-03

TABLE OF CONTENTS

Paragraph Page

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

REPLY TO
ATTENTION OF

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03

LOCATION: LTC E. Leslie Medford Armory Annapolis, MD

1. AUTHORITY. E-Mail dated 28 February 2003 from Ms [redacted], Industrial Hygienist, MD Army National Guard, to the USACHPPM Industrial Hygiene Field Services Program.

2. PURPOSE OF EVALUATION. To conduct surveys at Army National Guard (ARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions at ARNG facilities. The survey will serve to establish a baseline so that a worker's history of exposures is provided for each civilian or military employee.

3. BACKGROUND INFORMATION.

a. Armory Mission. Reconnaissance. First Squadron, 158th Cavalry Regiment.

b. Date of Construction. Built in 1958. The armory was renovated from 1999-2000.

c. POC. SGM [redacted]: (410) 974-7400.

d. Survey Date. 13 August 2003.

4. SUMMARY OF ACTIONS.

a. Sampling. Surface dust-lead wipe, air, and bulk paint sampling was conducted to determine the existence of lead-based paint and/or lead-based paint hazards (paint-lead hazards). Sample results and locations are in Table 1 and in Appendix D.

b. Physical Condition of Facilities.

(1) Paint. Staff Sergeant [redacted], Environmental Compliance Assessment Coordinator for the MD NGB, has records that state that lead has been abated in the armory. However, there is still deteriorated lead-based paint in the former indoor firing range.

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(2) Asbestos. Staff Sergeant [redacted] has records that state that all asbestos was abated in this armory.

(3) Mold. No mold was observed.

(4) Safety Hazards. The POC stated that there are no problems in the interior of the building. The concrete sidewalk outside the armory has buckled due to tree root growth. A contractor was hired to fix this problem. The contractor visited the site in the spring of 2003 but has not returned or contacted the armory (Photograph #s 1499 and 1500).

c. Other Building Concerns. None.

d. Safety and Industrial Hygiene Programs. There are no written program records at the armory.

e. Heating, Ventilation, and Air-conditioning System (HVAC). There is a central HVAC system throughout the armory.

f. Noise Dosimetry. No operation that could produce hazardous noise levels was identified.

g. Lighting. All areas appeared to be adequately lit and occupants reported no areas of deficient lighting. No lighting measurements were collected.

h. Converted indoor firing range (IFR). The former IFR was converted to a locker room in the early 1990s.

i. Photographs (Appendix C).

j. Site Maps (Appendix B).

k. Facility use by children. The POC stated that the building is often rented for public use and children often use this facility.

5. ASSESSMENT CRITERIA FOR LEAD. (Appendix A).

6. SAMPLING RESULTS. All three dust-lead wipe sample results were below the USACHPPM recommended decontamination level of 200μg/ft^2 for dust-lead on frequently contacted surfaces. However, two dust-lead wipe sample results exceeded the EPA lead exposure level for children of 40μg/ft^{2}on floors. One of three deteriorated paint sample results was 0.5 % lead and is lead-based paint. Deteriorated lead-based paint is hazardous to children.

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MDARNG Facilities IH Baseline Surveys, LTC E. Leslie Medford Armory Annapolis, MD
Project No. 55-ML-01ED-03

One additional sample was below the definition of lead-based paint, but exceeded the laboratory analytical detection limits of 0.005 %. This sample is referred to as lead-contaminated paint, and is potentially hazardous to children.

All air samples were below the laboratory analytical detection limit for lead in air of 0.005 to 0.006mg/m³ as well as the Occupational Health and Safety Administration (OSHA) standard of 50µg/m³ for lead in air.

See Table 1 for dust-lead wipe and bulk paint sample locations, photograph numbers, and analytical results. All sample results that are equal to or exceed 40µg/ft² of dust lead and 0.5% for bulk samples are highlighted.

Table 1 Sample Locations, Photograph numbers, and Analytical Results

Sample Numbers	Type of Sample	Location	Photo	Result µg/ft²
AP W01	Wipe	Baffle of former IFR (now locker room)	1496	45
AP W02	Wipe	Floor lanes of former IFR	1497	155
AP W03	Wipe	Top of locker in same area	1498	<23
				Result %
AP BULK01	Bulk	Boiler room floor		0.081
AP BULK02	Bulk	Weight room on wall in basement		<0.005
AP BULK03	Bulk	Floor of former IFR		0.5

7. DISCUSSION AND CONCLUSIONS.

a. The building is in good condition. The armory generally observes good housekeeping practices.

b. All air samples were below the laboratory analytical detection limit for lead in air of 0.005 to 0.006mg/m³ as well as the Occupational Health and Safety Administration (OSHA) standard of 50µg/m³ for lead in air.

c. All three dust-lead wipe sample results were below the USACHPPM recommended decontamination level of 200µg/ft² for dust-lead on frequently contacted surfaces. However, two dust-lead wipe sample results exceeded the EPA lead exposure level for children of 40µg/ft²on floors. Personnel using the locker room may be tracking lead out of the area and redistributing lead into adjacent rooms in the armory. This can result in lead exposures for children and for the general workforce.

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d. One of three deteriorated paint sample results was 0.5 % lead and is lead-based paint. Deteriorated lead-based paint is hazardous to children. One additional sample was below the definition of lead-based paint, but exceeded the laboratory analytical detection limits of 0.005 %. This sample is referred to as lead-contaminated paint, and is potentially hazardous to children.

e. Army Regulation 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them. Recleaning the areas that showed dust-lead may further prevent exposures for children and for the general workforce.

f. The sidewalk buckling due to tree root growth presents a potential trip hazard to personnel using the sidewalk.

8. RECOMMENDATIONS. Enclosure.

9. ADDITIONAL ASSISTANCE. For additional assistance, or questions concerning this report, please contact the undersigned at DSN 584-3118, commercial 410-436-3118, or by e-mail [redacted]@apg.amedd.army.mil.

[redacted]

INDUSTRIAL HYGIENIST
USACHPPM LEAD AND ASBESTOS TEAM LEADER
Industrial Hygiene Field Services Program
EPA AHERA Asbestos Inspector and Management Planner/
Certification Number MD-070340
EPA Lead Inspector and Lead Risk Assessor/
Certification Number 04-7913

ENCLOSURE

ANNAPOLIS ARMORY RECOMMENDATIONS

The Department of Defense Instruction Number (DODI) 6055.1 provides Risk Assessment Codes (RAC) for Health Hazards, a procedure which allows us to assess the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and combines the hazard severity and accident probability into a single numeral. RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority. The RAC for Lead Exposure in the former indoor firing range is classified as 5.

1. Lead Exposure.

a. Clean all areas in and adjacent to the former IFR where sampling results showed the presence of dust-lead. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. Apply a sealant to the area. Recleaning and sealing the IFR may further prevent lead from becoming redistributed into adjacent rooms and resulting in exposures for children and for the general workforce. Address all potential lead hazards before extending this facility to use for children. If children will continue to use this facility, clean surfaces to the EPA dust-lead standard for young children of 40µg/ft^2 on floors and clean to the USACHPPM decontamination level of 200µg/ft^2 for dust-lead on all other surfaces.

b. Repair and stabilize deteriorated paint.

c. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities. These workers are required to be in compliance with the OSHA lead in construction standard 29 CFR 1926.62.

d. There is a potential for personnel taking lead contamination out of the workplace into their vehicles and homes. Wear disposable gloves and disposable coveralls as extra protection when working in areas identified as having elevated levels of lead.

2. Safety. Address the problem of the concrete sidewalk buckling due to tree root growth. This presents a potential trip hazard for people using the sidewalk.

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MDARNG Facilities IH Baseline Surveys LTC (MD) E. Leslie Medford Armory, Annapolis, MD Project No. 55-ML-01ED-03

APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

Subject: Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 $\mu g/ft^2$. This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. EPA standards (40 CFR 745.227(e)(8)(viii))are not directly applicable because they are developed for floors (40 $\mu g/ft^2$), windowsills (250 $\mu g/ft^2$) and window troughs (400 $\mu g/ft^2$) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. OSHA has no specific requirement for work area surfaces. The lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. OSHA used to cite a level of 200 $\mu g/ft^2$ in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 $\mu g/ft^2$ is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels above these recommendations do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All states will receive this guidance when it is completed.

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m^3 averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

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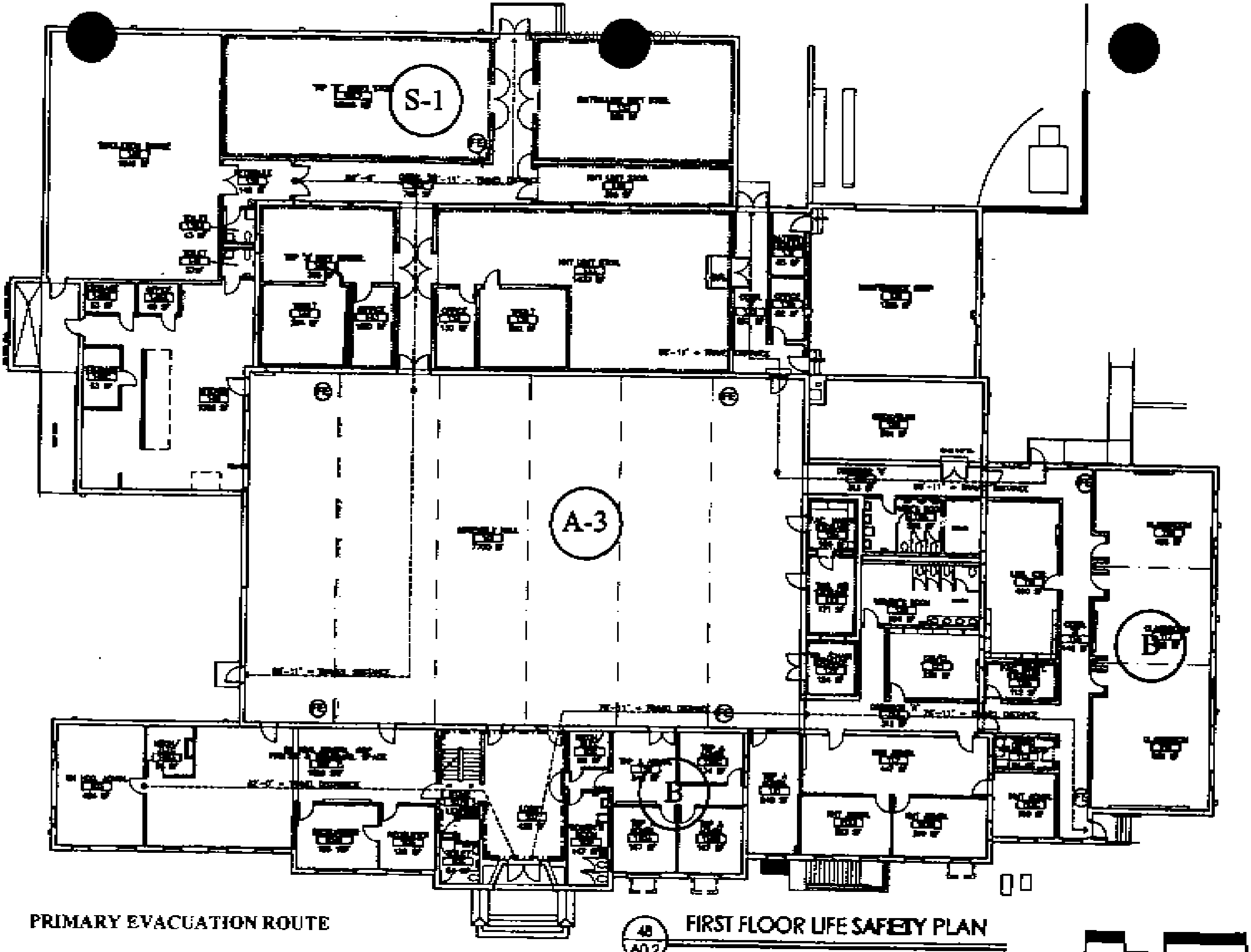
MDARNG Facilities IH Baseline Surveys LTC (MD) E. Leslie Medford Armory, Annapolis, MD Project No. 55-ML-01ED-03

APPENDIX B

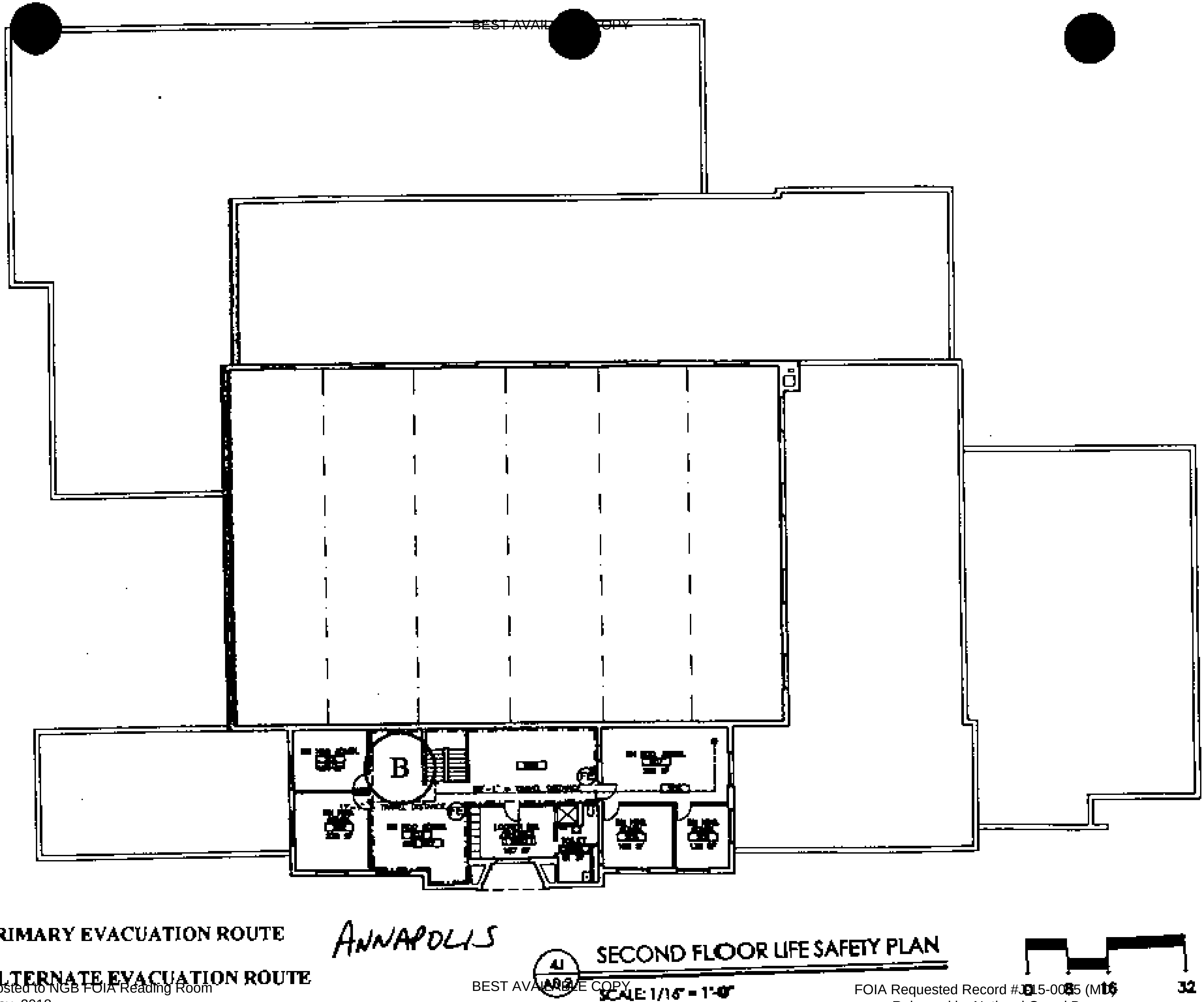
SITE MAPS



PRIMARY EVACUATION ROUTE

ALTERNATE EVACUATION ROUTE

ANNAPOLIS NG ARMORY

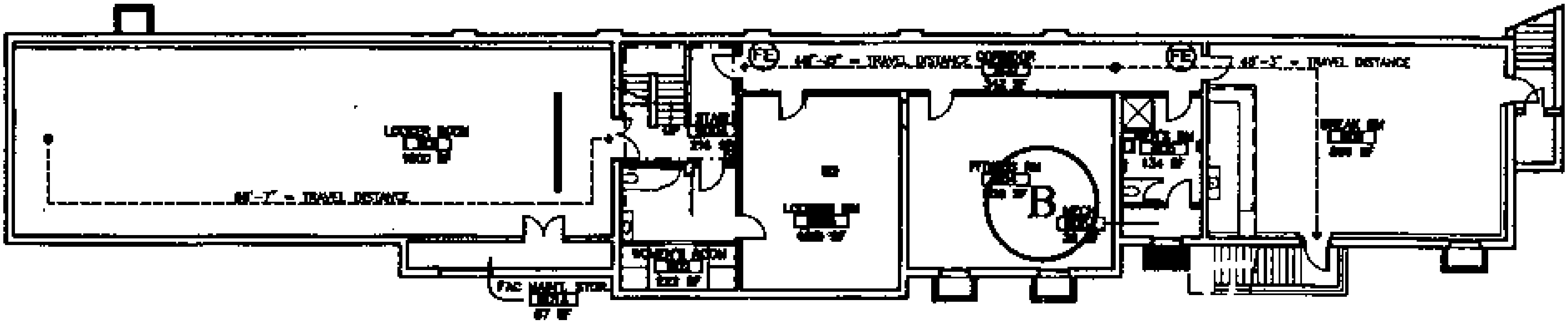


PRIMARY EVACUATION ROUTE

ANNAPOLIS

ALTERNATE EVACUATION ROUTE

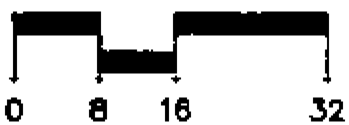
BEST AVAILABLE COPY



ANNAPOLIS

7B / A0.2 BASEMENT LIFE SAFETY PLAN

SCALE: 1/16" = 1'-0"



PRIMARY EVACUATION ROUTE

ALTERNATE EVACUATION ROUTE

MDARNG Facilities IH Baseline Surveys LTC (MD) E. Leslie Medford Armory, Annapolis, MD Project No. 55-ML-01ED-03

APPENDIX C

PHOTOGRAPHS

ANNAPOLIS ARMORY

Photo Number	Photo Location
1496	Baffle of former IFR (now locker room)
1497	Floor lanes of former IFR
1498	Top of locker in same area
1499/1500	Concrete Sidewalk buckled due to tree roots

1496

1497

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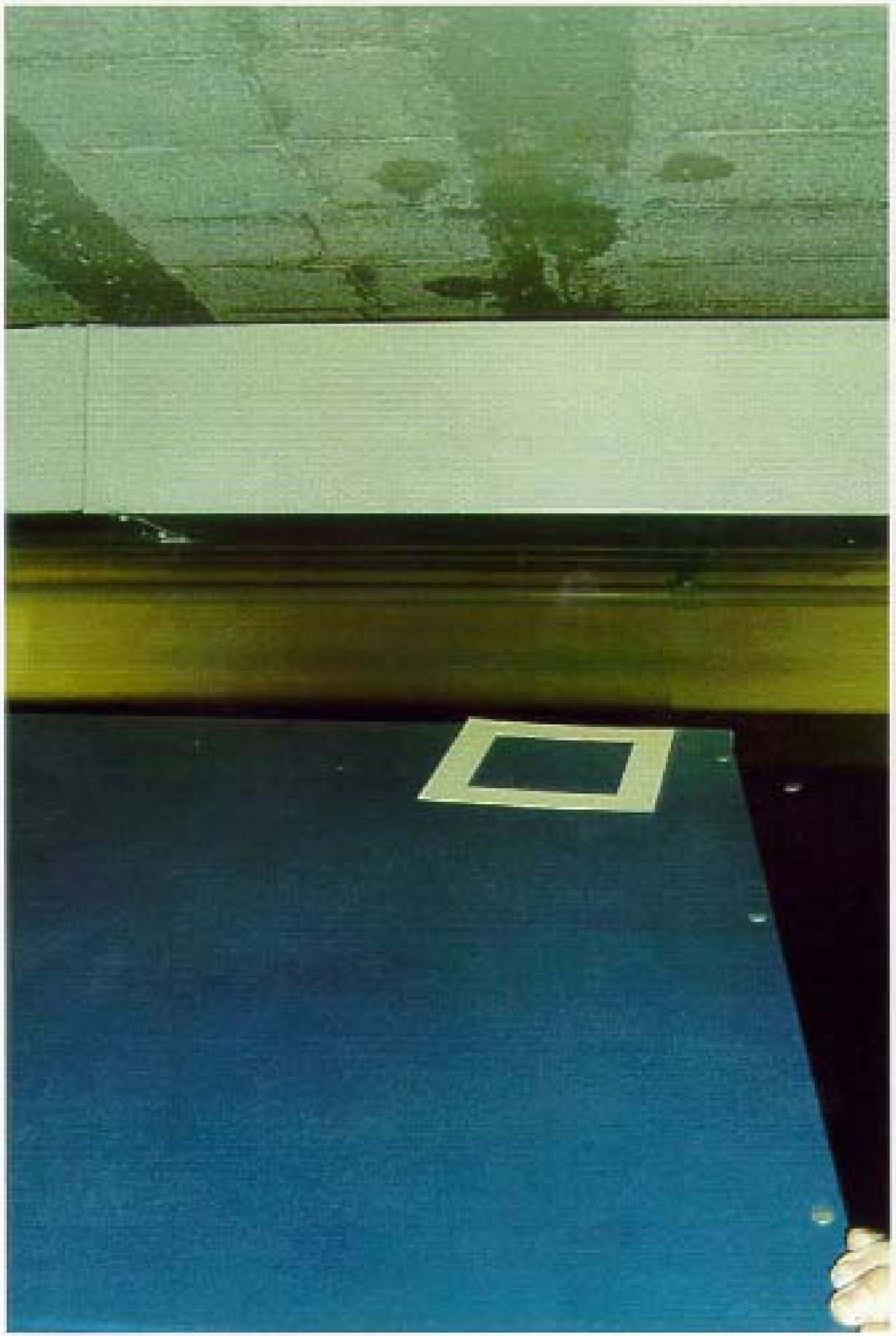

1498

1499

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1500

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APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

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Wipe Sample #	Armory	City	Indoor Range Info: Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (µg/ft²)
				Yes		Yes		
AP W01	Annapolis	Annapolis					Baffle of former IFR (now locker room)	45
AP W02	Annapolis	Annapolis					Floor lanes of former IFR	155
AP W03	Annapolis	Annapolis					Top of locker in same area	<23

DATA CHEM LABORATORIES, INC.

Submitted To: [redacted]t
Commander, USACHPPM
5158 Blackhawk Road, Attn: MCHB-TS-OFS
APG, MD 21010-5403

Reference Data:	**Lead**
Client Sample No.:	APAS01 through APBlank02
P.O. No.:	Not Available
Sample Location:	Annapolis NG Armory
Sample Type:	Filter
Method Reference:	NIOSH 7300
DCL Set ID No.:	03-S-4148
DCL Sample ID No.:	03-25422 through 03-25426
Sample Receipt Date:	8/27/2003
Preparation Date:	08/27/03
Analysis Date:	08/27/03

The samples were prepared and analyzed in accordance with NIOSH method 7300 using a Perkin Elmer 3000XL ICP.

The sample condition upon receipt was acceptable except where noted.

The results are in the enclosed data table. Results relate only to the items tested and are not blank corrected unless indicated in the data table.

This report shall not be reproduced except in full, without the written approval of the laboratory.

[redacted]
Analyst

[redacted]
Reviewer

CINCINNATI OFFICE
4388 GLENDALE-MILFORD ROAD
CINCINNATI, OHIO 45242-3706
513 733-5336, FAX 513 733-5347

WEST COAST OFFICE
11 SANTA YORMA COURT
NOVATO, CALIFORNIA 94945
800 280-8071, FAX 415 893-9469

Results
Lead

Client #	DCL #	Sample Volume (L)	µg/sample	mg/m^3
APAS01	03-25422	183.8	ND	<0.005
APAS02	03-25423	173.7	ND	<0.006
APAS03	03-25424	172.9	ND	<0.006
APBlank01	03-25425	0	ND	-
APBlank02	03-25426	0	ND	-
	Prep Blank		ND	
% Recovery	LCS		101.	
RPL			**1.**	

ND = not detected at or above the reporting limit (RPL).
LCS = laboratory control sample.

Non-Responsive [redacted]
Analyst

Non-Responsive [redacted]
Reviewer

[redacted] Ms USACHPPM

From: [redacted] [results@resienv.com]

Sent: Tuesday, August 26, 2003 3:26 PM

To: [redacted]apg.amedd.army.mil; [redacted]

Subject: RES 96610-1; Cascade MD and Anapolis MD

Outgoing mail is certified Virus Free.
Checked by AVG anti-virus system (http://www.grisoft.com).
Version: 6.0.512 / Virus Database: 309 - Release Date: 8/19/2003

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896
AIHA Certificate of Accreditation #480 LAB ID 101533

TABLE ANALYSIS: LEAD IN PAINT

RES Job Number:	**RES 96610-1**
Client:	**Army National Guard IH - West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**Cascade MD and Anapolis MD**
Date Samples Received:	**August 19, 2003**
Analysis Type:	**USEPA SW846 3050B / AA (7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 22, 2003**

Client ID Number	Lab ID Number	Detection Limit (%)	LEAD CONCENTRATION (%)
APBULK01	EM 806477	0.005	0.081
APBULK02	EM 806478	0.005	BDL
APBULK03	EM 806479	0.005	0.488

BDL = Below Detection Limit

Data Qa

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD BY WIPE SAMPLING

RES Job Number:	**RES 96610-1**
Client:	**Army National Guard III - West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**Cascade MD and Anapolis MD**
Date Samples Received:	**August 19, 2003**
Analysis Type:	**USEPA SW846 3050B / AA(7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 22, 2003**

Client ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
CDBLANK1	EM 806468	0.11	BDL	23	BDL
CDW01	EM 806469	0.11	320.0	23	2909
CDW02	EM 806470	0.11	BDL	23	BDL
CDW03	EM 806471	0.11	BDL	23	BDL
CDW04	EM 806472	0.11	BDL	23	BDL
APBLANK1	EM 806473	0.11	BDL	23	BDL
APW01	EM 806474	0.11	5.0	23	45
APW02	EM 806475	0.11	17.0	23	155
APW03	EM 806476	0.11	BDL	23	BDL

***Calculations Based On A 1 sq.ft. Sample Area Unless Otherwise Noted**

BDL = Below Detection Limit

Data Qa

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MDARNG Home

LTC (MD) E. Leslie Medford Armory

18 Willow Street
Annapolis, MD 21401-3113
(Directions)

"The Governor's Guard"
1st Squadron, 158th Cavalry Regiment (RECON)

Call 410-974-7617 for info

Local Recruiter: SFC [redacted]

Tenant Units:

- 1st Squadron, 158th Cavalry Regiment (RECON) *"The Governor's Guard"*
  - Headquarters
  - Headquarters and Headquarters Troop
  - Troop A
- Organizational Maintenance Shop #11A

UNDER CONSTRUCTION

Last Update: 17 FEB 99 17:01:40 EST

MDARNG Home

1st Squadron, 158th Cavalry Regiment
The Governor's Guard

The **158th Cavalry Regiment** is a component of the **29th Aviation Brigade, 29th Infantry Division (Light)**.

Established: A.D. 1877 at Annapolis, Maryland

Lineage:

- The Governor's Guard
- Company G, 1st Maryland Infantry Regiment (circa A.D. 1886)
- Company M, 1st Maryland Infantry Regiment [Spanish-American War]
- Company M, 115th Infantry Regiment, 29th Infantry Division (circa A.D. 1917) [France]
- Company M, 115th Infantry Regiment, 29th Infantry Division (circa A.D. 1941)
- 29th Quartermaster Company (circa A.D. 1947)
- Comapny A, 229th Supply & Transp[ortation Battalion (circa A.D. 1963)
- Troop B, 1st Squadron, 223rd Cavalry Regiment, 28th Infantry Division *"Keystone Division"*(circa A.D. 1968)
- Troop B, 158th Cavalry Squadron, 58th Infantry Brigade (circa A.D. 1975)
- 1st Squadron, 158th Cavalry Regiment, 29th Infantry Division (Light) (circa A.D. 1985)

Campaigns:

Regimental Honors/Awards:

Mission: Support operations of the 29th Infantry Division (Light) through:

- Reconnaissance and Surveillance
- Security
- Screening Operations
- Intelligence and Electronic-warfare
- Facilitation of Command-and-Control

MDARNG Facilities IH Baseline Surveys LTC (MD) E. Leslie Medford Armory, Annapolis, MD Project No. 55-ML-01ED-03

APPENDIX E

REFERENCES

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APPENDIX E

REGULATIONS AND STANDARDS

1. Title 29, Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration, current ed. http://www.osha.gov/comp-links.html.

2. Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program, August 19, 1998. http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf.

3. AR 40-5, Medical Service, Preventive Medicine, 15 October 1990. http://www.usapa.army.mil/pdffiles/r40_5.pdf.

4. AR 385-10, The Army Safety Program, 29 February 2000. http://www.usapa.army.mil/pdffiles/r385_10.pdf.

5. DA PAM 40-503, Medical Services, Industrial Hygiene Program, 30 October 2000. http://www.usapa.army.mil/pdffiles/p40_503.pdf.

6. Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs), American Conference of Governmental Industrial Hygienists (ACGIH), current ed.

7. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 62-2002, Ventilation for Acceptable Indoor Air Quality.

8. RP-1-1993, Office Lighting, ANSI/ESNA.

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MDARNG Facilities IH Baseline Surveys LTC (MD) E. Leslie Medford Armory, Annapolis, MD Project No. 55-ML-01ED-03

APPENDIX F

LEAD CLEANING GUIDANCE

CHAPTER 14: CLEANING

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
3. Have sufficient cleaning equipment and supplies *before* beginning work.
4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
13. Paint or otherwise seal treated surfaces and interior floors.
14. Conduct a clearance examination (see Chapter 15).
15. If clearance is not achieved, repeat the final cleaning.

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16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.

17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.

18. Cleaning equipment list:

    - HEPA vacuums.
    - Detergent.
    - Waterproof gloves.
    - Rags.
    - Sponges.
    - Mops.
    - Buckets.
    - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
    - 6-mil plastic bags.
    - Debris containers.
    - Waste water containers.
    - Shovels.
    - Rakes.
    - Water-misting sprayers.
    - 6-mil polyethylene sheeting (or equivalent).

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Chapter 14: Cleaning

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris *and* dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

✓ Is the critical importance of cleaning in a hazard control project understood?

✓ Have all workers been trained and certified for hazard control work?

✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?

✓ Have cleaning equipment and materials been obtained?

✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?

✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?

✓ Are all workers properly protected during the cleaning processes (see Chapter9)?

✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?

✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?

✓ Are the clearance criteria to be met fully understood?

✓ Have all appropriate surfaces been properly painted or otherwise sealed?

✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

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Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards *and* were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

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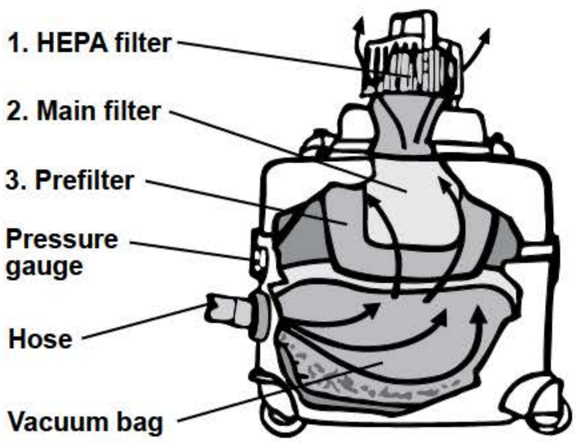
Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and pre-filter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the pre-filter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

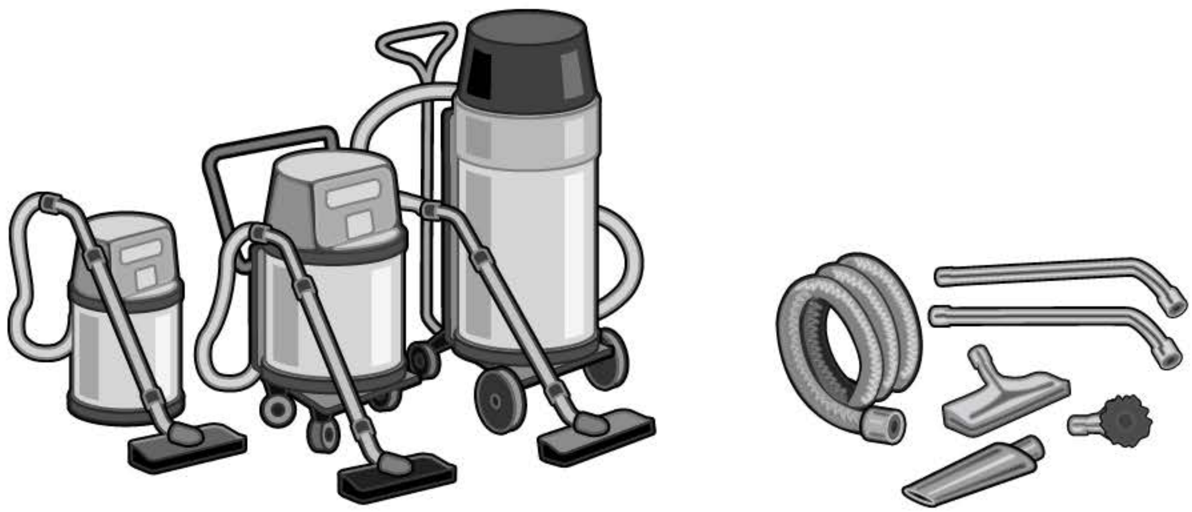
2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

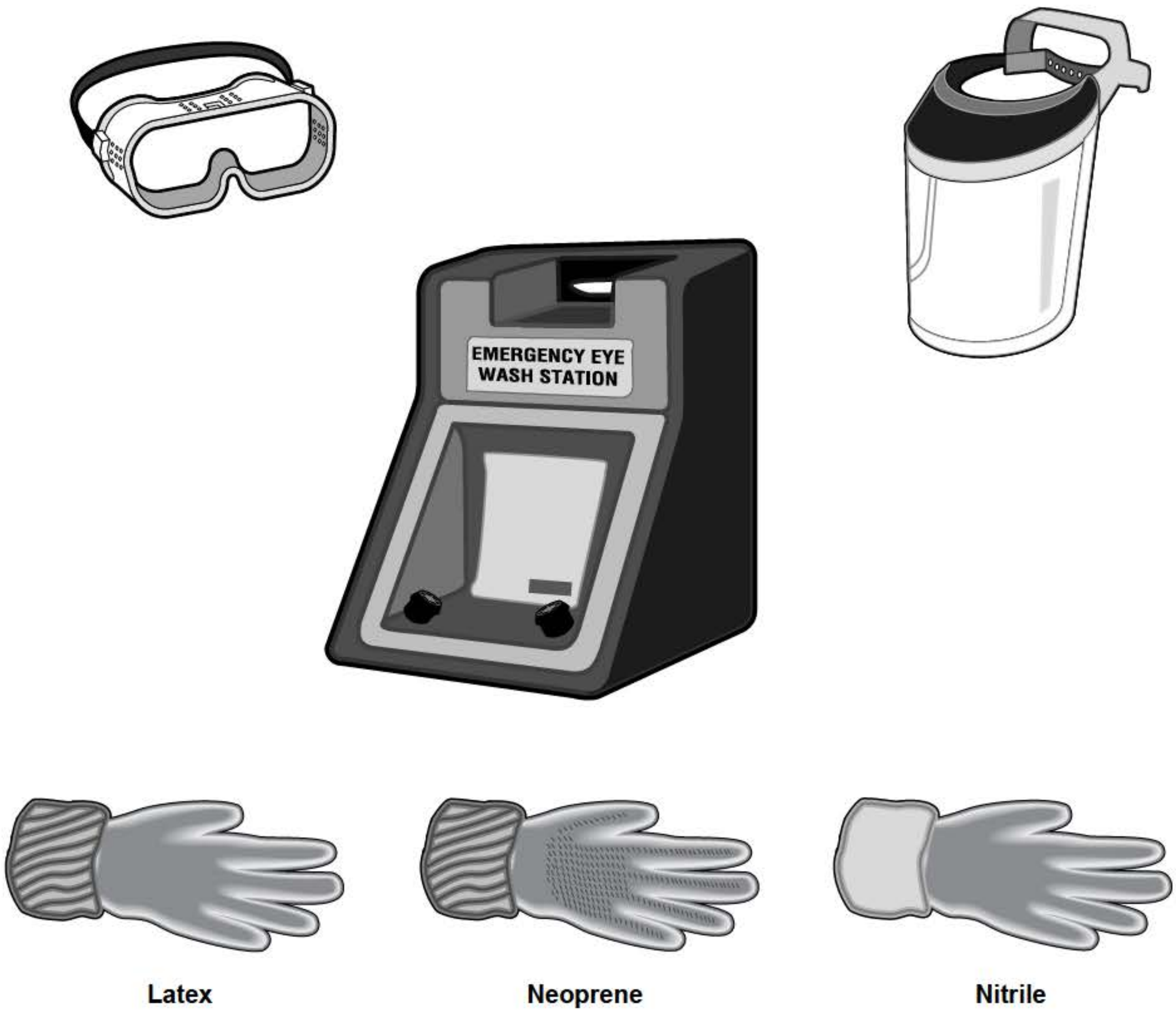
Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

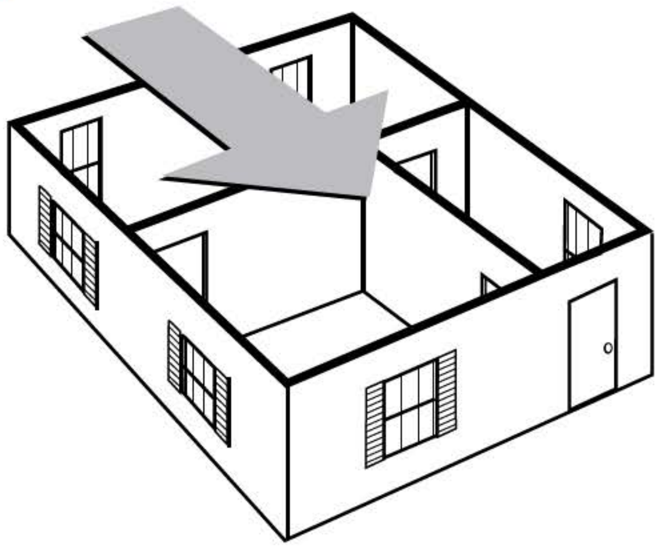
Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

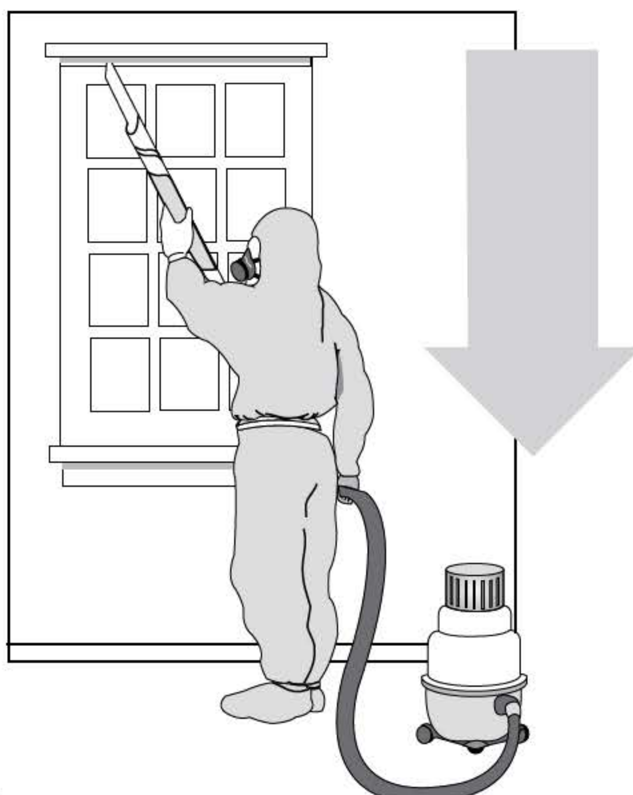
- First, the area is HEPA vacuumed.

Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on, and work down to the floor. Do every inch of the windows, especially the window troughs.



Courtesy: Alice Hamilton Occupational Health Center

- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.

Rubber Cone

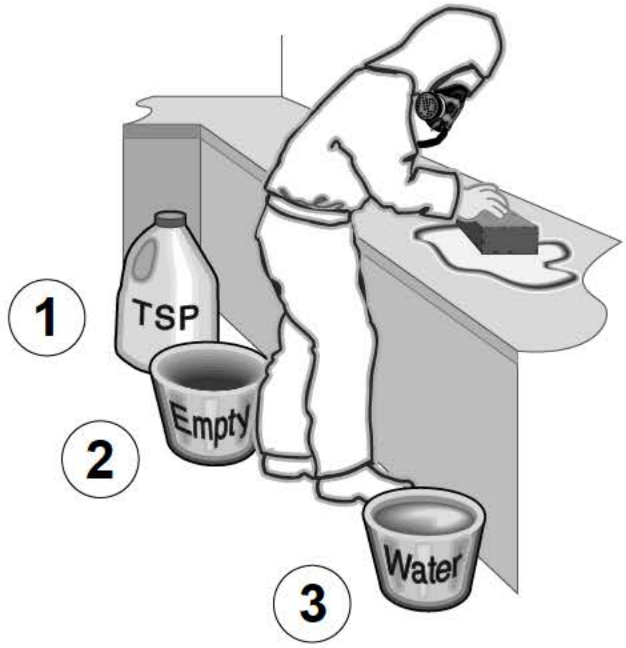
Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

Figure 14.4c (continued)

Wash all surfaces with suitable detergents
Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces

Wet Mop Floor

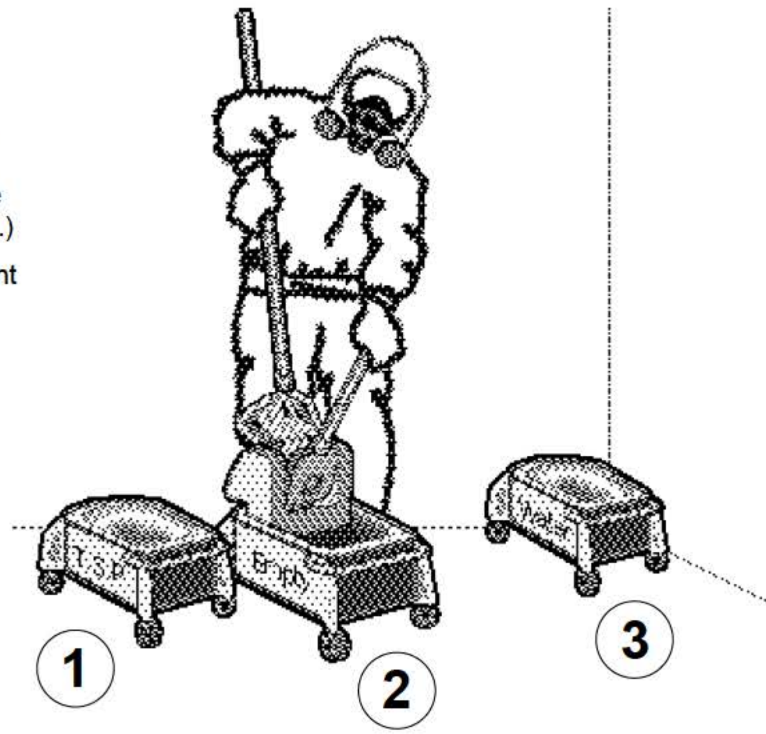
Don't Dry Sweep

Figure 14.4c (continued)

Use the 3-Bucket System.

To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.



Squeeze out the mophead in empty bucket #2. Return to bucket #1 for more detergent solution and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

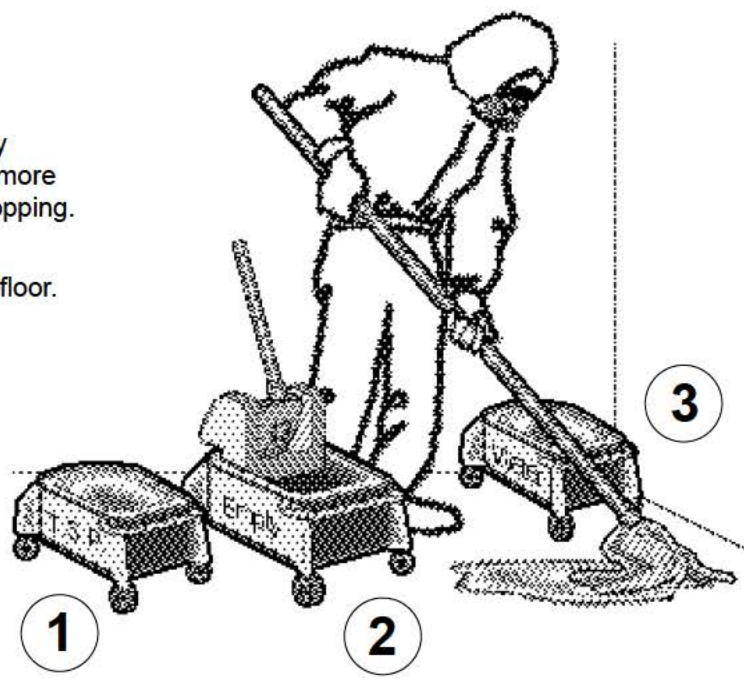
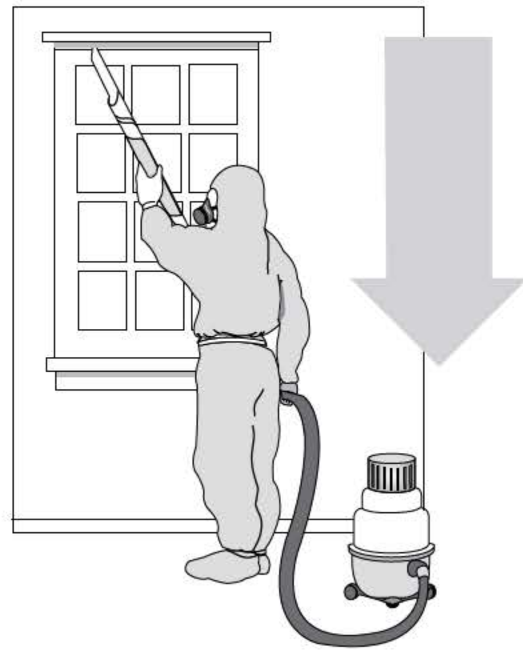


Figure 14.4d (continued)

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.

Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water *and cleaned.* All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

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the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).

Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This

option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dust-retaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table 14.1 Initial Cleaning Wipe-Test Failure Rates for Various Abatement Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)

and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993).

These *Guidelines* do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Cycle Number	Mass Removal Efficiency Percentages			
	Cleaning Method			
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.8	67.0	29.4
5	59.3	88.9	72.1	32.5
6	61.6	91.2	74.4	34.9
7	63.8	93.1	76.4	36.5
8	67.5	95.4	77.5	38.1
9	67.5	97.7	78.7	40.1
10	67.2	100.0	80.2	41.7
11		102.3	80.2	41.7
12		104.6	84.1	44.8
13		104.6	84.5	46.8
14		103.8	84.5	48.4
15				49.6
16				50.8
17				52.4
18				53.6
19				54.4
20				55.2

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) *Effectiveness of Clean-up Techniques for Leaded Paint Dust*

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MDARNG Facilities IH Baseline Surveys LTC (MD) E. Leslie Medford Armory, Annapolis, MD Project No. 55-ML-01ED-03

APPENDIX G

MOLD GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

TG 277

FEBRUARY 2002

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

Concern about indoor exposure to mold has been increasing as the public becomes more aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions.

This document provides the best and most current guidance for remediation of clean water damage (<48 hours) and mold contamination (>48 hours) into one resourceful Army guide. This guide has been designed to provide information to facilities management individuals who have little or no experience with mold remediation. It will assist them in making a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to develop or evaluate an in-house remediation plan or evaluate a remediation plan submitted by an outside contractor. If an outside contractor is employed, they must have experience cleaning up mold. Check their references, and have them follow the recommendations presented in this document, EPA guidelines, and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). A multi-disciplinary team approach to mold concerns is best. A health and safety professional, such as an industrial hygienist, should be consulted prior to any remediation activities to assist in the project.

Molds produce tiny spores to reproduce. Mold spores float through the indoor and outdoor air continually. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or uncorrected. There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.(1)

In all situations, the underlying cause of water accumulation must be rectified or mold growth will recur. Any initial water infiltration should be stopped and clean up began immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth. (Refer to Appendix A for detailed guidance on clean water damage response). If the source of water is elevated humidity, actions to maintain the relative humidity levels below 60% to inhibit mold growth should be taken (2). Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilating, and air-conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide adequate drainage and slope the ground away from the foundation.

REMEDIATION PLANNING

- Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Select cleanup methods for moldy items (Appendix B)
- Select Personal Protection Equipment (PPE)- protect remediators (Appendix B)
- Select containment equipment - protect building occupants (Appendix B)
- Select remediation personnel who have the experience and training needed to implement the remediation plan and use PPE and containment as appropriate

REMEDIATE MOISTURE AND MOLD PROBLEMS

- Fix moisture problem, implement repair plan and/or maintenance plan
- Dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Clean and dry moldy materials (Appendix B)
- Discard moldy porous items that can't be cleaned (Appendix B)

REMEDIATION PROCEDURES

Four levels of abatement are described below. The size of the area impacted by mold contamination primarily determines the type of remediation. The sizing levels below are based on professional judgment and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of mold and preventing dust contaminated with mold from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement. The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. (3)

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be discarded if possible. All materials to be reused should be dry and visibly free from mold. Routine inspections should be conducted to confirm the effectiveness of remediation work. (1 and 3)

The use of bleach or other biocides is questionable in most cases (8). The effectiveness of bleach in reducing living mold is dependent on concentration, residual chlorine levels, and contact time on the surface (8). All of these factors are difficult to control during remediation. Removal of all mold growth can generally be accomplished by physical removal of materials supporting active growth and thorough cleaning of non-porous materials (4). Therefore, application of a biocide serves no purpose that could not be accomplished with a detergent or cleaning agent (4).

The use of gaseous ozone or chlorine dioxide for remedial purposes is **not** recommended. Both compounds are highly toxic and contamination of occupied space may pose a health threat. Furthermore, the effectiveness of these treatments is unproven. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."(4)

FOUR REMEDIATION LEVELS

[Adapted from NYCDOH Guidelines on Assessment and Remediation of Fungi in Indoor Environments (3) and EPA (1)]

Level I: Small Isolated Areas – Total surface area affected less than 10 square feet - e.g., ceiling tiles, small areas on walls. Refer to Appendix B for detailed guidance.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas used by remediation workers for egress should be cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Level II: Medium – Total Surface Area affected between 10 and 100 square feet - e.g., several wallboard panels. (See Appendix B for detailed guidance).

The following procedures *at a minimum* are recommended:

Refer to Appendix C for proper PPE selection. Limited or Full protection may be required depending on the situation.

Refer to Appendix D for Containment procedures.

The work area and areas directly adjacent should be covered with a single layer of 6 mil fire-retardant polyethylene sheet(s) and taped before remediation, to contain dust/debris.

Seal ventilation ducts/grills in the work area and areas directly adjacent with 6 mil polyethylene sheeting. Use an exhaust fan with a High Efficiency Particulate Air (HEPA) filter to generate negative pressurization.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and surrounding areas should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level III be followed.

Level III: Large Area – Total Surface Area affected greater than 100 square feet or potential for increased occupant or remediator exposure during remediation is estimated to be significant. (See Appendix B for detailed guidance).

The following procedures are recommended:

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from occupied spaces using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft^2) follow Level I guidance for PPE and containment and for a areas (>10 ft^2) follow Medium (Level II) or when greater than 100 ft^2 follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended (7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and removed in double-bagged 6-mil plastic. When a decontamination room is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

All areas should be left dry and visibly free from contamination and debris.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air (4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If remediation sampling is necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HAZARD COMMUNICATION

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.

3. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water Damage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£	
Water-Damaged Material†	**Actions**
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours§	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans.
Ceiling tiles	• Discard and replace.
Cellulose insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	• Discard and replace.

Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling should be pried away from wall for drying

£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.
These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

† If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

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APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

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APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*[1] will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination[2].

Safety Tips While Investigating and Evaluating Mold and Moisture Problems[3]

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate[1].

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems[3].

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination[2].

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air[4]. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control[4]."

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program. For further mold assistance, contact USACHPPM, Industrial Hygiene Field Services Program, DSN 584-3118 or (410) 436-3118.

References

1. USACHPPM Technical Guide 277, *Army Facilities Management Information Document on Mold Remediation Issues*, February 2002.

2. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

3. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

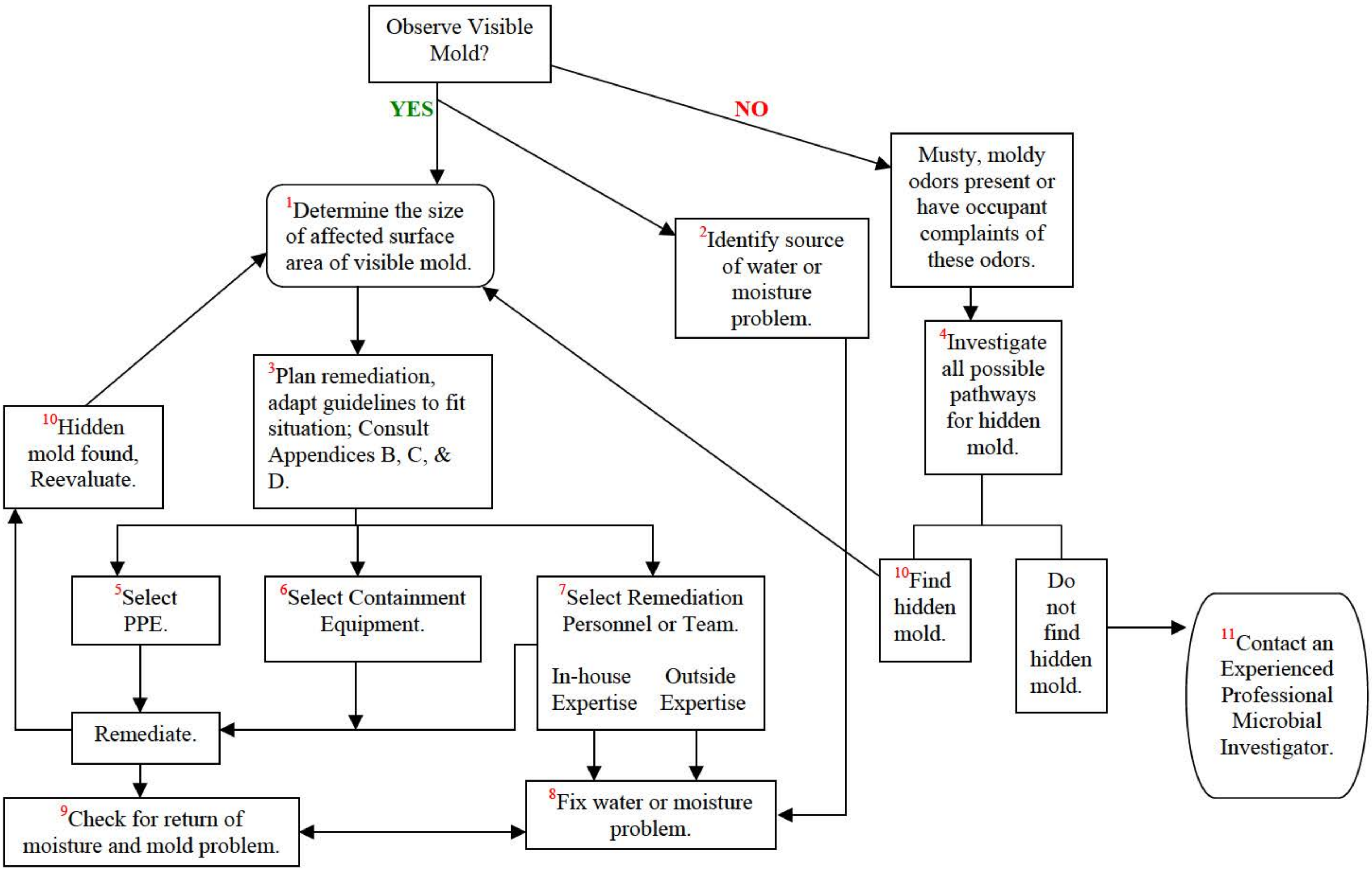
7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134*. 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

MOLD INVESTIGATION DECISION LOGIC



MOLD INVESTIGATION DECISION LOGIC NOTES:

1. Roughly approximate the total surface area of visible mold. Categorization of the remediation levels are sometimes borderline, so when trying to decide the category to apply, consider the extent of visible growth, such as a heavy blanket of growth on the surface, to barely visible. If heavy growth is apparent, consider moving up to the next level of protection.

2. Do not skip this step. Address the source of water or moisture problem or the mold will simply reappear.

3. Always protect the health and safety of the building occupants and remediators.

4. Mold may be hiding on the backside of drywall, vinyl wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads. Check walls behind furniture, pipe chases and utility tunnels, porous thermal or acoustic liners inside ductwork, or check the rafters (due to roof leaks or insufficient insulation)[3].

5. Utilize appendices B and C for remediation guidance. Use your best judgment during investigations, if not disturbing the mold you may need minimal to no PPE. Do not alarm building occupants unnecessarily, but protect yourself as necessary.

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities[3]. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

®TYVEK, DuPont de Nemours, E.I., & Co., Wilmington, DE.

APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene Survey

National Guard Facility
Annapolis Armory
18 Willow Street
Annapolis, MD 21401

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Annapolis Armory** **18 Willow Street** **Annapolis, MD 21401**
Prepared By:	**Analytical Laboratory Services, Inc.** **3544 North Progress Avenue** **Suite 100** **Harrisburg, PA 17110**
Survey Date:	**September 30, 2010**
Report Date:	**October 25, 2010**
ALSI Project #:	**1010634**

Non-Responsive
[redacted]

Director, Environmental Health & Safety

3544 North Progress Avenue ✦ Suite 100 ✦ Harrisburg, PA 17110
TEL: 717-540-3424 ✦ FAX: 717-540-3428

Table of Contents

Section 1.0
Executive Summary

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on September 30, 2010, at the Annapolis Armory located at 18 Willow Street, Annapolis, MD 21401. The survey was performed by Ms. [redacted] and Mr. [redacted]

1. Lead surface and air samples were collected. All sample results were less than recommended guidelines or regulatory standards.

2. Lighting levels met the minimum recommended guidelines in all but the following areas: 1) Drill Hall 2) Room 148 3) Attached Garage. Lighting should be improved in these areas.

3. Indoor air quality parameters of temperature, relative humidity carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment. Relative humidity exceeded the recommended ceiling of 60% in most locations. Relative humidity should be maintained at 30-60%. Low relative humidity can lead to the drying of mucous tissues and an increased susceptibility to respiratory infection. High relative humidity can provide an environment suitable for microbial growth and proliferation.

4. Water damaged ceilings and active roof leaks are present. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

5. Possible fungal growth was observed on the supply and return vents. These should be regularly cleaned. Do not permit dirt, debris, microbial growth, etc. to accumulate in any portion of the HVAC system. Supply and return vents should be cleaned.

6. The overhead vehicle exhaust ventilation system in the garage does not meet the minimum requirements. This system should be inspected to determine if it is operating as designed and meets the minimum requirements as recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation: A Manual of Recommended Practice for Design (27th Edition).

Section 2.0
Operation Description & Observations

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Section 2.0 Operation Description & Observations

The Annapolis Armory is mainly an administrative facility with offices, training and storage areas. There were approximately fourteen full-time employees stationed at this facility at the time of this survey.

The building was initially constructed in 1958. It was renovated in 2000. The exterior is brick. Interior walls are concrete block or drywall. There are concrete floors and some carpeted areas.

There is a central heating, ventilating, and air conditioning (HVAC) system. There are two air-handling units (AHU) present on the roof. These were not accessible for inspection. There is a gas-fired boiler present. Air-conditioning was on during this survey. In addition, many windows and doors were open. Outdoor conditions on the day of survey were cloudy and rain.

There is an old firing range in the building. It was closed in the 1970's and has been fully abated. It is now a gym/exercise area. There is no child-care facility in the building.

Overall housekeeping was good. Areas were clean and well kept.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared properly designed. Personnel had supportive chairs.

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Section 3.0
Noise Survey

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Section 3.0 Noise Survey

Employees were not performing tasks that provided excessive noise levels. Therefore, noise exposure monitoring was not conducted.

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Section 4.0
Lead Testing

Section 4.0 Lead Testing

At the time of the assessment, no activities were observed which would generate lead exposure. The facility contains a gym area which was once an indoor firing range.

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 um mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2	Paint Chip %Pb
1	Drill Hall	<3.4		
2	CPT Perez's Office	<3.6		
3	Drill Hall - Floor (Center)		<110	
4	Drill Hall – Food Serving Counter		<110	
5	Drill Hall - Metal Tabletop		<110	
6	Kitchen – Metal Countertop		<110	
7	Room 148 - Top of Locker		<110	
8	Floor Outside Room 145		<110	
9	Attached Garage – Top of Red Toolbox		<110	
10	Room 117 – Supply Vent		<110	
11	Room 116 – Top of Computer Desk		<110	
12	Room 112 – Top of Filing Cabinet		<110	
13	Admin. Center – Top of Desk		<110	
14	Gym, Converted Firing Range – Floor		<110	
15	Gym, Converted Firing Range – Supply Vent		<110	
16	Gym, Converted Firing Range – Top of Locker		<110	
17	Floor Outside Gym, Converted Firing Range		<110	
18	Club House – Top of Bar		<110	
19	Second Floor Center Desk Area – Top of Metal Table		<110	
20	Second Floor Center Desk Area - Window Sill		<110	
21	Blank		<12 (ug)	
22	Blank	<3 (ug)		
Criteria		**50**	**200**	**0.5**

Key: **Bolded** results exceed listed criteria

Lead surface and air samples were collected. All sample results were less than recommended guidelines or regulatory standards.

The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for Environmental Chemicals," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 ug/m^3. In fact, no detectable level of lead was identified in the air samples collected.

Deteriorated paint was observed on ductwork in the Drill Hall and Room 148. Peeling and damaged paint should be repaired and properly remediated.

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Section 5.0
Lighting

Section 5.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. K070003). The light meter was last calibrated on November 26, 2009. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Drill Hall	22.4	30-50	No
Kitchen	70.1	50	Yes
Room 143	66.6	30-50	Yes
Room 148	28.2	30-50	No
Room 118	82.2	30-50	Yes
Room 116	141.6	30-50	Yes
Room 112	126.0	30-50	Yes
Room 102	87.7	30-50	Yes
Room 103	148.8	30-50	Yes
Room 207	80.1	30-50	Yes
Second Floor Desk Area	70.4	30-50	Yes
Basement Gym	85.2	30	Yes
B04 Locker Room	41.3	7	Yes
Club House	88.8	30-50	Yes
Attached Garage	31.2	75	No

Lighting levels met the minimum recommended guidelines in all but the following areas: 1) Drill Hall 2) Room 148 3) Attached Garage. Lighting should be improved in these areas.

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Section 6.0
Indoor Air Quality

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Section 6.0 Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7565X (Serial # 0839020). The IAQ Meter was last calibrated in March 2010.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2007). ASHRAE specifies temperature and relative humidity ranges for human comfort (ASHRAE 55-2004). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60% in occupied areas.

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 69.6 to 78.2 degrees F with relative humidity readings ranging from 44.1% to 89.7%. During the survey, carbon dioxide (CO_2) levels ranged from 344 ppm to 601 ppm within the facility compared to an outdoor CO_2 level of 320 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,020 ppm (320 ppm + 700 ppm). Carbon monoxide (CO) ranged from 0.0 – 0.1 ppm.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	77.2	87.6	318	0.1
Drill Hall	77.4	**85.4**	344	0.0
Kitchen	78.2	**84.5**	363	0.0
Room 143	76.9	50.1	593	0.0
Room 148	72.8	55.7	375	0.0
Room 118	75.4	**72.0**	601	0.1
Room 116	75.3	**73.4**	408	0.0
Room 112	74.6	**61.2**	385	0.0
Room 102	71.9	44.1	492	0.1
Room 103	69.6	44.2	441	0.0
Room 207	69.7	**67.0**	433	0.0
Second Floor Desk Area	70.0	**72.2**	366	0.0
Basement Gym	72.3	**89.1**	388	0.0
B04 - Locker Room	73.6	**89.6**	464	0.0
Club House	74.6	**73.4**	408	0.0
Attached Garage	77.7	**89.7**	486	0.0

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	76.3	91.1	321	0.0
Criteria	**73.0-79.0**	**30-60**	**<1,020**	**<9.0**

Key: **Bolded** results exceed listed criteria

Relative humidity exceeded the recommended ceiling of 60% in most locations. There is central air conditioning system in the building however, many windows and doors were open at the time of this survey. Outdoor conditions were raining and windy. Relative humidity should be maintained at 30-60%. Low relative humidity can lead to the drying of mucous tissues and an increased susceptibility to respiratory infection. High relative humidity can provide an environment suitable for microbial growth and proliferation.

Carbon dioxide levels did not exceed the recommended ceiling of 1,020 ppm. This suggests that outdoor air ventilation is adequate in this area. There is a mechanical ventilation system for this facility which provides outdoor air ventilation.

Carbon monoxide levels were less than the recommended ceiling of 9 PPM.

A visual inspection was conducted throughout visually accessible portions of the facility. The visual inspection was conducted to assess sources or pathways of factors potentially deleterious to IAQ. The visual inspection revealed the following items that may be potential sources of poor IAQ:

1. Carpeting is old and stained throughout the facility.

2. Water was observed running down the wall in the Drill Hall due to rain. Paint is peeling and chipping.

3. In the Clubhouse water was running under the door from a nearby stairwell. Carpeting near the door was wet.

4. In Room B04 a small amount of suspected fungal growth was observed on the ductwork.

5. Water damaged ceilings and active roof leaks are present.

6. Supply vents have condensation present. Possible fungal growth was observed on the supply and return vents. Do not permit dirt, debris, microbial growth, etc. to accumulate in any portion of the HVAC system. Supply and return vents should be cleaned.

All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

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Section 7.0
Suspect Asbestos Containing Building Materials

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Section 7.0 Suspect Asbestos Containing Building Materials

Suspect asbestos containing materials (ACM) could include sheetrock/joint compound, plaster wall and ceiling systems, floor tiles and associated mastic, and vinyl cove base. Thermal system insulation which is most likely a combination of paper wrapped fiberglass with PVC elbows and well as pre-formed TSI with mudded elbows is a suspect material. No samples were collected. Inaccessible areas were not inspected.

The only suspect ACM noted at the time of this survey was window glazing on the exterior windows of the Drill Hall.

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Section 8.0
Maintenance Bay

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Section 8.0 Maintenance Bay

There is a garage area at this facility. It is sometimes used for maintenance of vehicles. No maintenance work was being performed on the day of this survey.

A Local Exhaust Ventilation (LEV) system is present to remove vehicle exhaust from the building. The LEV system contains two drops or exhausts. The LEV in each bay consists of a flex duct with an area of 7.5" x 3.5". The following flow rates were measured:

1. Bay 1 – 133 CFM
2. Bay 2 – 144 CFM

The actual flow rate that is required in an overhead vehicle exhaust system varies depending on the engine tail pipe temperature, whether or not the vehicle is "under load" or idling, engine displacement, engine size, etc. As an example, a 15 Liter Engine running at 1,000 rpm with an exhaust gas temperature of 1,300 F (heavy load) would require an exhaust flow of 2,110 CFM. We recommend the overhead vehicle exhaust system be inspected to determine if it is operating as designed and meets the minimum requirements as recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation: A Manual of Recommended Practice for Design (27^{th} Edition).

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Section 9.0
Limitations

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Section 9.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Analytical Laboratory Services, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A
Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP 10920

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	Annapolis Amory	**Chain Of Custody:**	508936		
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Annapolis, MD	**Date Submitted:**	10/5/2010		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	10/11/2010	**Report Date:**	10/12/2010
Attention:	[redacted]						

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
1103042	1010634-1	Flame	Air	879	N/A	3.4	ug/m^3	<3	<3.4	ug/m^3	
1103043	1010634-2	Flame	Air	842	N/A	3.6	ug/m^3	<3	<3.6	ug/m^3	
1103044	1010634-3	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103045	1010634-4	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103046	1010634-5	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103047	1010634-6	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103048	1010634-7	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103049	1010634-8	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103050	1010634-9	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103051	1010634-10	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103052	1010634-11	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103053	1010634-12	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103054	1010634-13	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103055	1010634-14	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103056	1010634-15	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103057	1010634-16	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103058	1010634-17	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103059	1010634-18	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1103060	1010634-19	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AIHA, NVLAP, NIST, or any agency of the Federal Government.

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP
10920

Client:	National Guard Bureau	**Job Name:**	Annapolis Amory	**Chain Of Custody:**	508936
Address:	301-1H Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Annapolis, MD	**Date Submitted:**	10/5/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	10/11/2010 **Report Date:** 10/12/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Total ug	Final Result	Comments
1103061	1010634-20	Flame	Wipe	****	0.108	110 ug/ft^2	<12	<110 ug/ft^2	
1103062	1010634-21	Flame	Wipe Blank	****	N/A	12 ug		<12 ug	
1103063	1010634-22	Flame	Air Blank	0	N/A	3 ug/m^3		<3 ug	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7421; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)

%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accreditation applies only to paint chip, wipe, and soil samples.

Analys[redacted] Technical Manager: [redacted]

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Page 1 of 2

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AMA Analytical Services, Inc.
Focused on Results www.amalab.com
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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **508936**

p. 1/2

Mailing/Billing Information:

1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SL State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:

1. Job Name: Annapolis Armory
2. Job Location: Annapolis, MD
3. Job #: ________ P.O. #: W912K6-09-A-0003
4. Contact Person: [redacted]
5. Submitted by: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ____	☐ Immediate ☐ 3 Day	☒ Inclu[redacted]
☐ 24 Hours Time Due: ____	☐ Next Day ☒ 5 Day + 10/12/10	☒ E[redacted]callab.com
Comments: ____	☐ 2 Day Date Due: 10/12/10	☐ Fax: [redacted]
	Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☐ Verba[redacted]

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ________ (QTY)
☐ Fiberglass ________ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ________ (QTY)
☐ NIOSH 7402 ________ (QTY)
☐ Other (specify ________) ________ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ________ (QTY)
☐ EPA Point Count ________ (QTY)
☐ NY State Friable 198.1 ________ (QTY)
☐ Grav. Reduction ELAP 198.6 ________ (QTY)
☐ Other (specify ________) ________ (QTY)
MISC
☐ Vermiculite
☐ Asbestos-Soil PLM __ (Qual PLM) __ (Quant PLM/TEM) __ (Qual PLM/TEM) __ (Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ________ (QTY)
☐ NY State PLM/TEM ________ (QTY)
☐ Residual Ash ________ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ________ (QTY)
☐ Quant. (s/area) Vacuum D5755-95 ________ (QTY)
☐ Quant. (s/area) Dust D6480-99 ________ (QTY)
TEM Water
☐ Qual. (pres/abs) ________ (QTY)
☐ ELAP 198.2/EPA 100.2 ________ (QTY)
☐ EPA 100.1 ________ (QTY)

☒ All samples received in good condition unless otherwise noted.
(Tlast Water samples ______ °C)

Metals Analysis
☐ Pb Paint Chip ________ (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 10 (QTY)
☒ Pb Air 2 (QTY)
☐ Pb Soil/Solid ________ (QTY)
☐ Pb TCLP ________ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ________) ________ (QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ________
Collection Media ________
☐ Spore-Trap ______ (QTY) ☐ Surface Vacuum Dust ______ (QTY)
☐ Surface Swab ______ (QTY) ☐ Culturable ID Genus (Media ______) ______ (QTY)
☐ Surface Tape ______ (QTY) ☐ Culturable ID Species (Media ______) ______ (QTY)
☐ Other (Specify ______) ______ (QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1010634-1	Drill Hall	9/30	879					X		X						
1010634-2	1PT Perez's Office		842					X		X						
1010634-3	Drill Hall Fl			100cm²				X				X				
1010634-4	Drill Hall Food Counter Serving							X				X				
1010634-5	Drill Hall Metal Tabletop							X				X				
1010634-6	Kitchen Metal Countertop							X				X				
1010634-7	Rm 118 Top of Locker							X				X				
1010634-8	Fl Outside Rm 145							X				X				
1010634-9	Attache Garage Top of Rail							X				X				
1010634-10	Rm 117 Supply Vent							X				X				
1010634-11	Rm 116 Top of Computer							X				X				
1010634-12	Rm 116 Top of Cabinet Filing							X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
[redacted]		

LABORATORY STAFF ONLY: (CUSTODY)

1. Date/Time RCVD: 10/05/10 @ 1000 Via: UPS By (Print) [redacted]
2. Date/Time Analyzed: ____/____/____ @ ____ By (Print) ____
3. Results Reported To: ________ Via: ____
4. Comments: ________

Page 2 of 2

[redacted]

DWL(410)247-2874 150202 210 REV. 6.06

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
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CHAIN OF CUSTODY

(Please Refer To This Number For Inquiries) 508936 p2/2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-4H Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Annapolis Armory
2. Job Location: Annapolis, MD
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person: [redacted] @ phone # (410) 942-0273
5. Submitted by: Signature:

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ 3 Day ☐ Next Day ☒ 5 Day + ☐ 2 Day Date Due: ☐ Results Required By Noon (Every Attempt Will Be Made to Accommodate)	☒ Include COC/Field Data Sheets with Report ☒ Email [redacted] s.army.mil ☐ Fax [redacted] s.army.mil ☐ Verbal

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM __ (Qual) PLM __ (Quant) PLM/TEM __ (Qual) PLM/TEM __ (Quant)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area) Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☐ Pb Dust Wipe (wipe type ____) ____ (QTY)
☐ Pb Air ____ (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	[illegible]	SPORE TRAP	TAPE	SWAB
1010634-13	Admin Center Top of Desk	9/25		100cm²				X				X				
1010634-14	Gym - Floor							X				X				
1010634-15	Gym - Supply Vent							X				X				
1010634-16	Gym - Top of Locker							X				X				
1010634-17	El Outside Gym							X				X				
1010634-18	Clubhouse Towel Bar							X				X				
1010634-19	2nd Fl Center [illegible]							X				X				
1010634-20	2nd Fl Center [illegible] Window Sill							X				X				
1010634-21	Blank			0cm²				X				X				
1010634-22	Blank		0					X		X						

Converted Firing Range (CFR)

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY):
1. Date/Time RCVD: __/__/__ @ ____ Via: ____ By (Print): ____ Sign: ____
2. Date/Time Analyzed: __/__/__ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: __/__/__ Time: ____ Initials: ____
4. Comments:

[redacted]

Appendix B
Photographs

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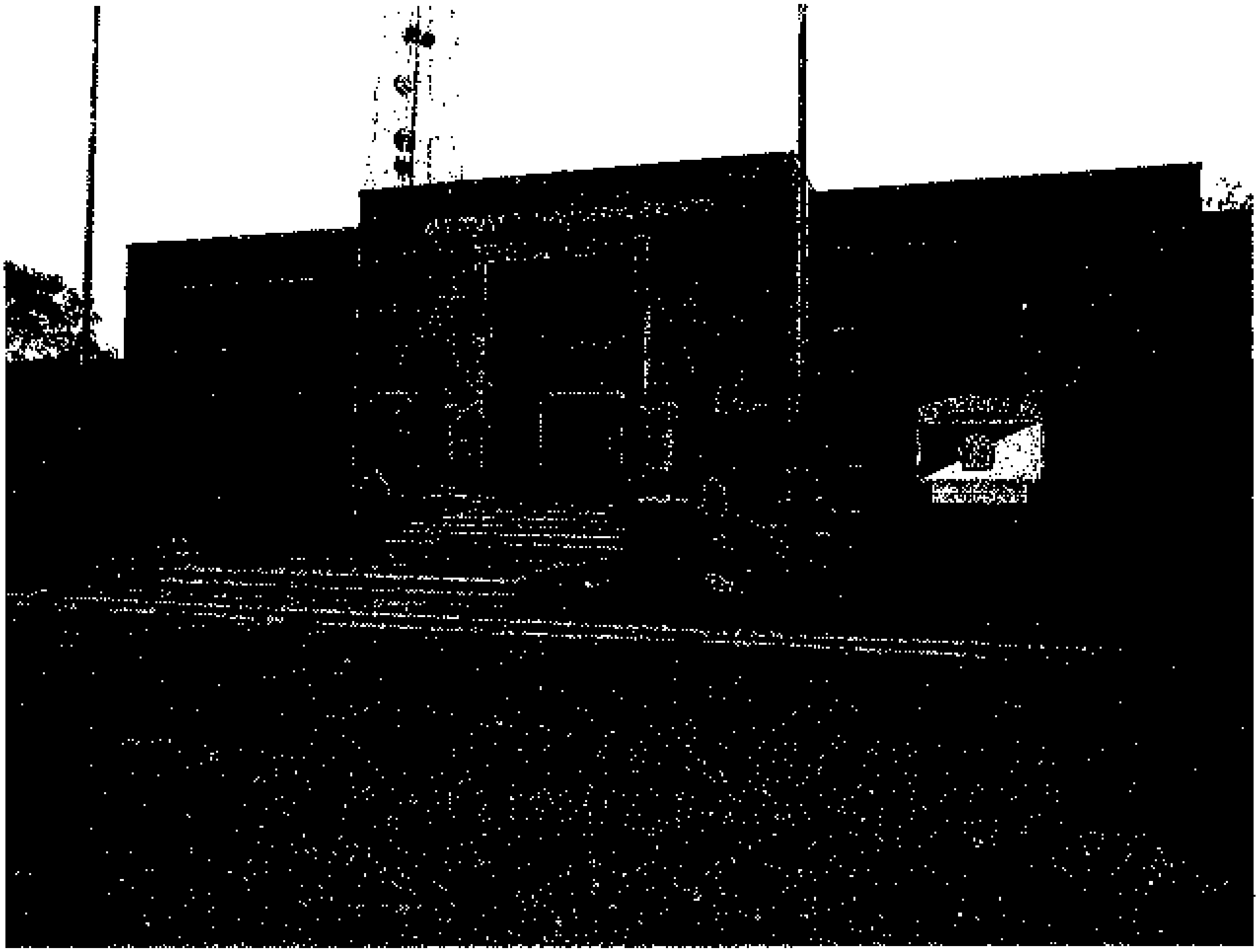

Annapolis MD
Exterior of Building

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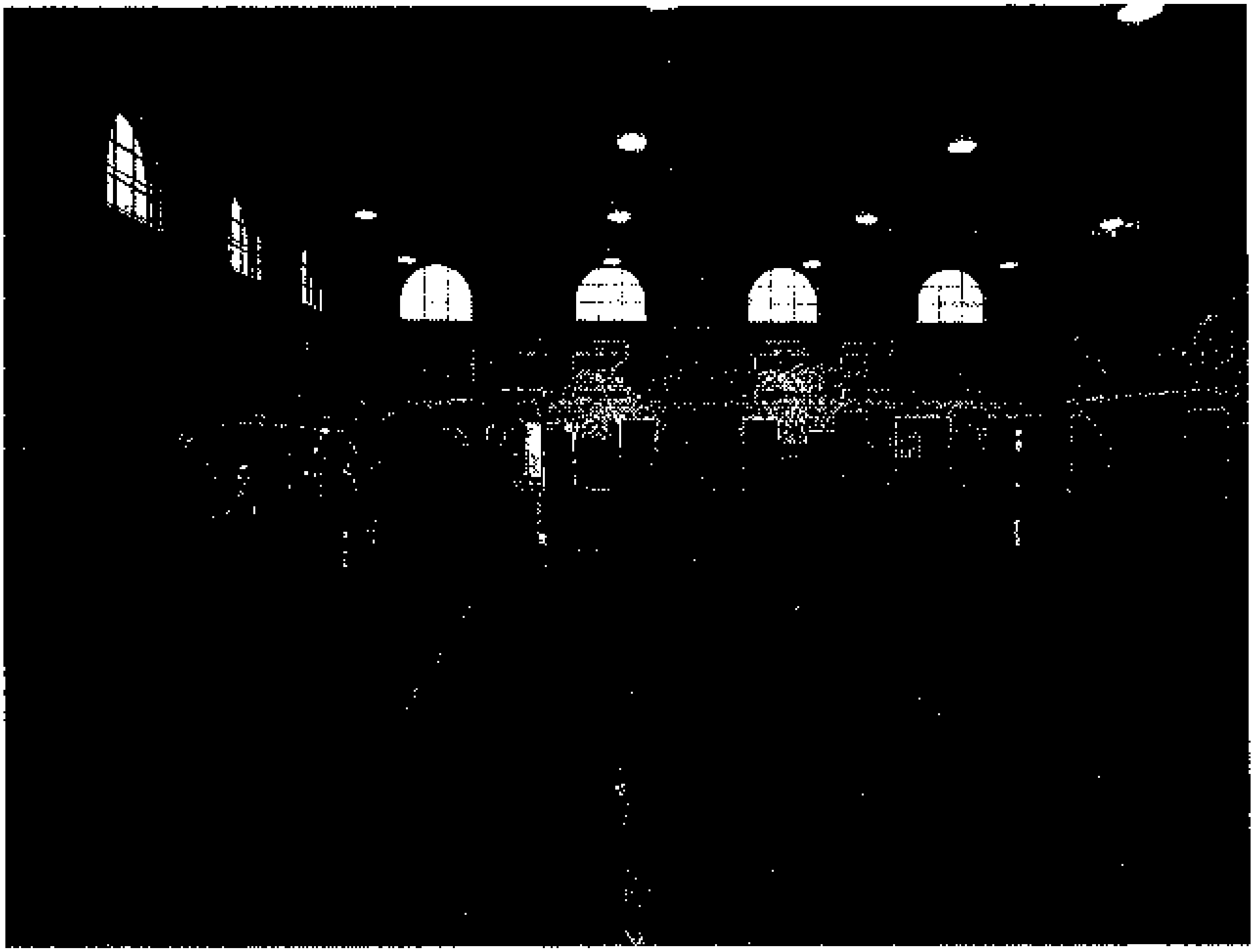
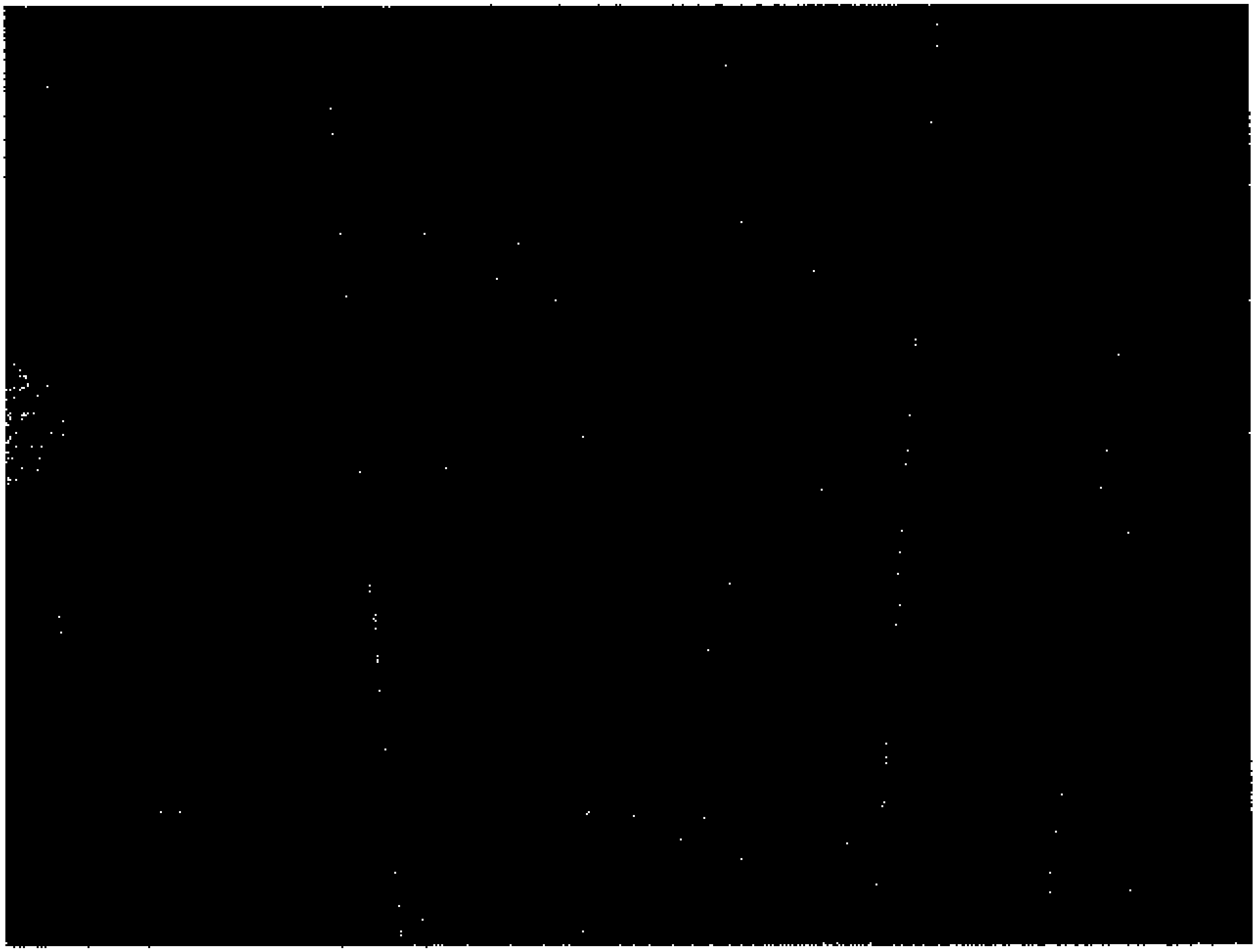


Annapolis MD
Drill Hall



Annapolis MD
Drill Hall - Chipping/Peeling Paint on Ductwork

Annapolis MD
Room 148 – Chipping/Peeling Paint on Ductwork

Annapolis MD
Attached Garage

Annapolis MD
Attached Garage – Exhaust Duct

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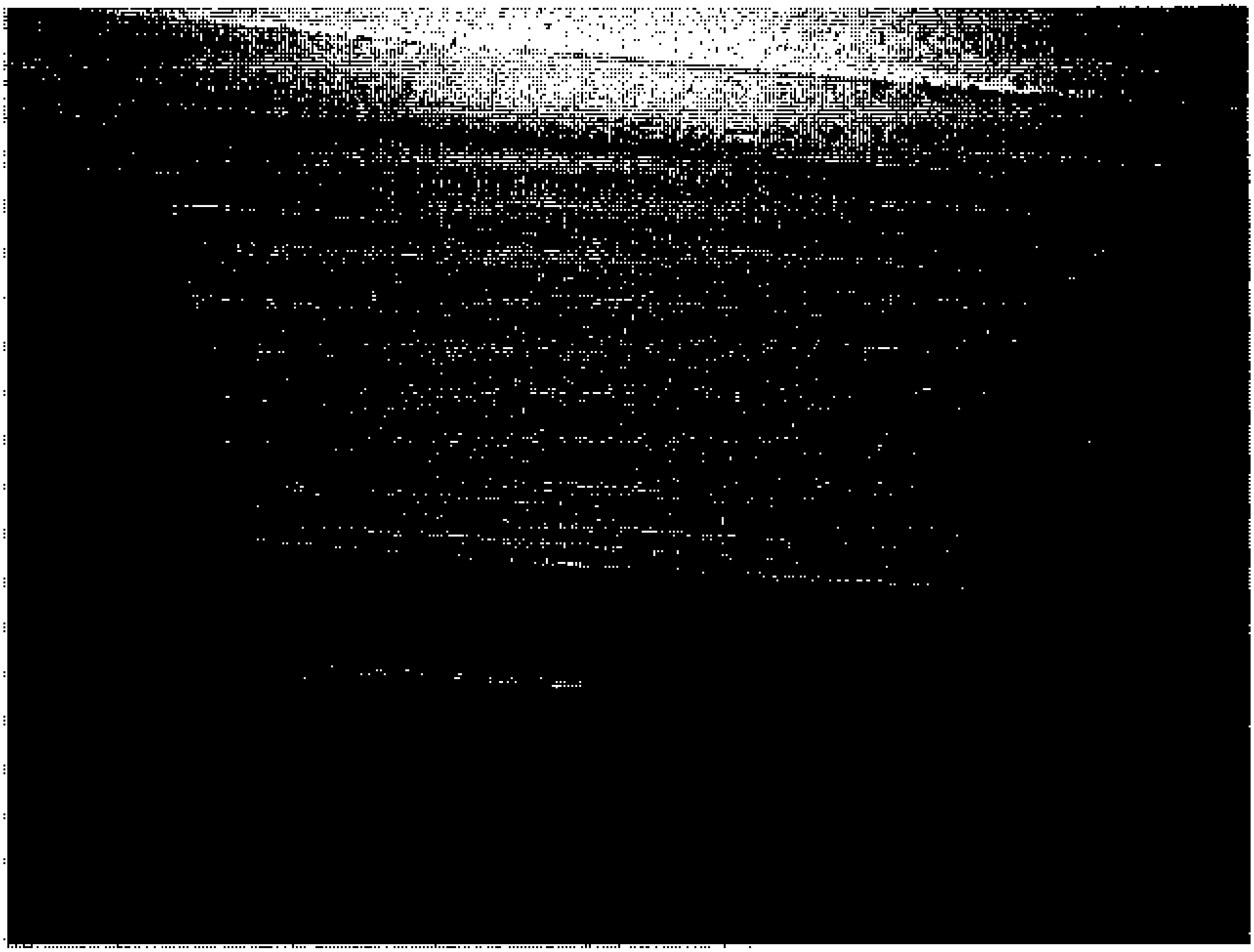

Annapolis MD
Newer Part of Building Hallway - Dirty Return Grill

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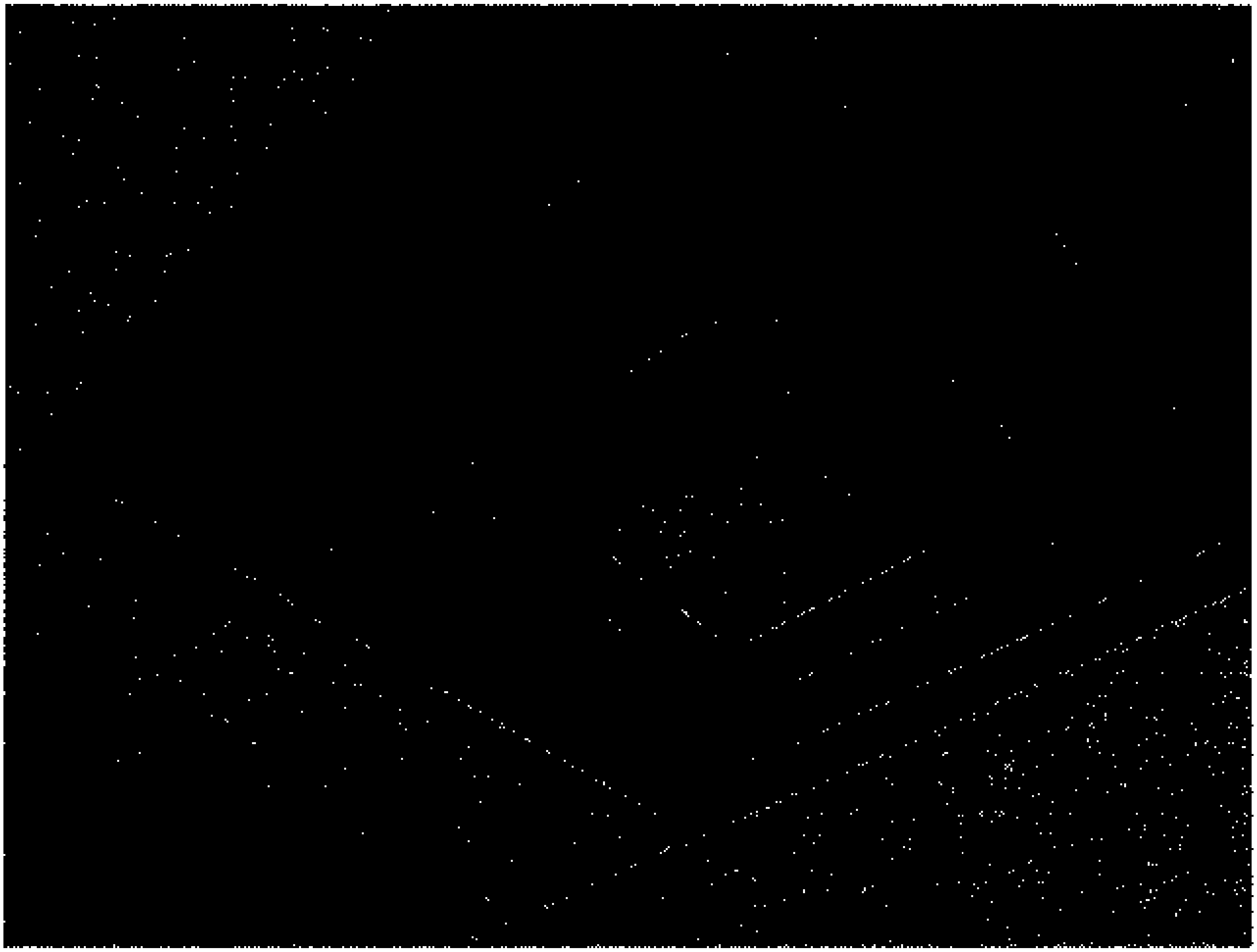
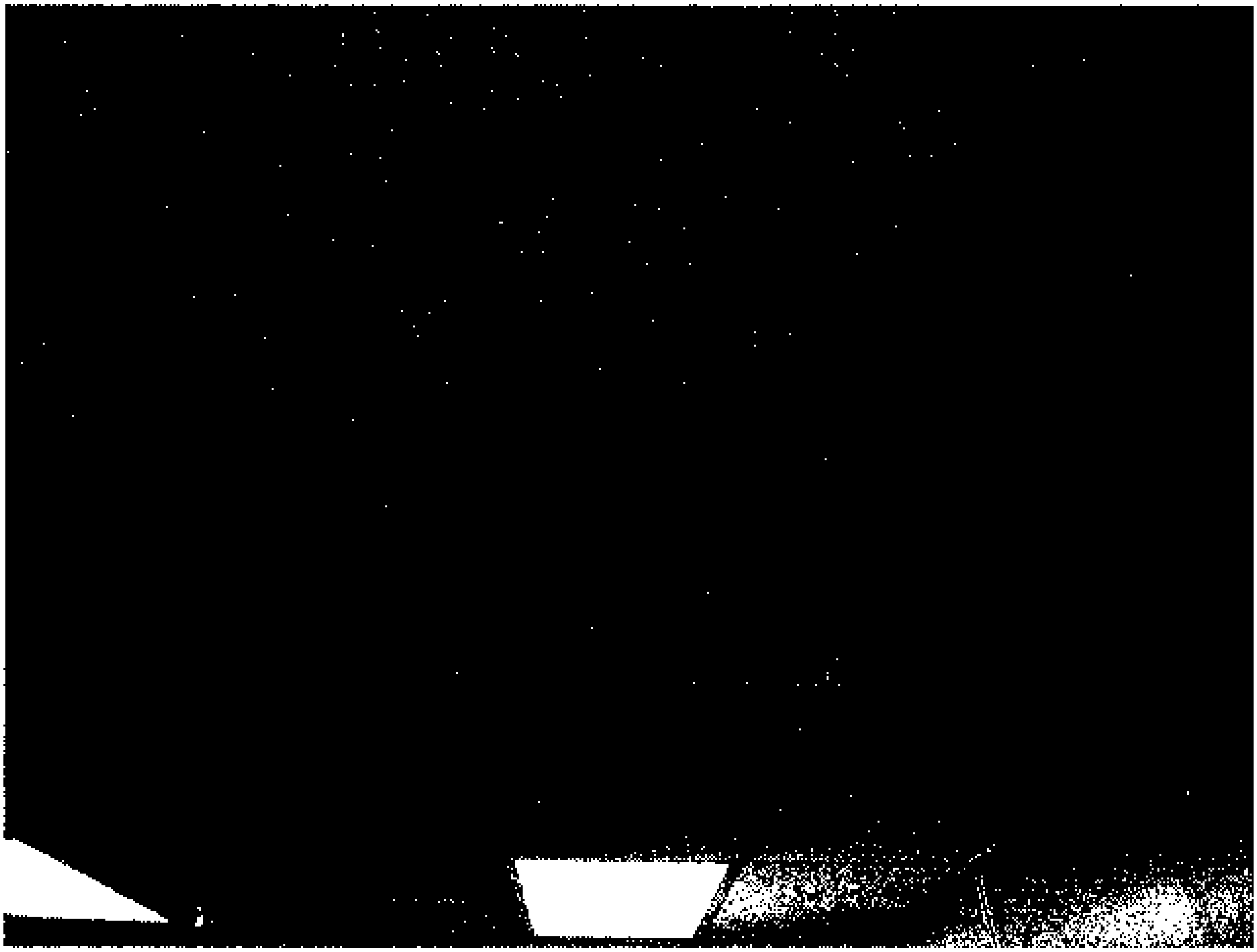


Annapolis MD
Room 112   Condensation on Supply Vent



Annapolis MD
Room 112 – Stained and Currently Wet Ceiling Tile

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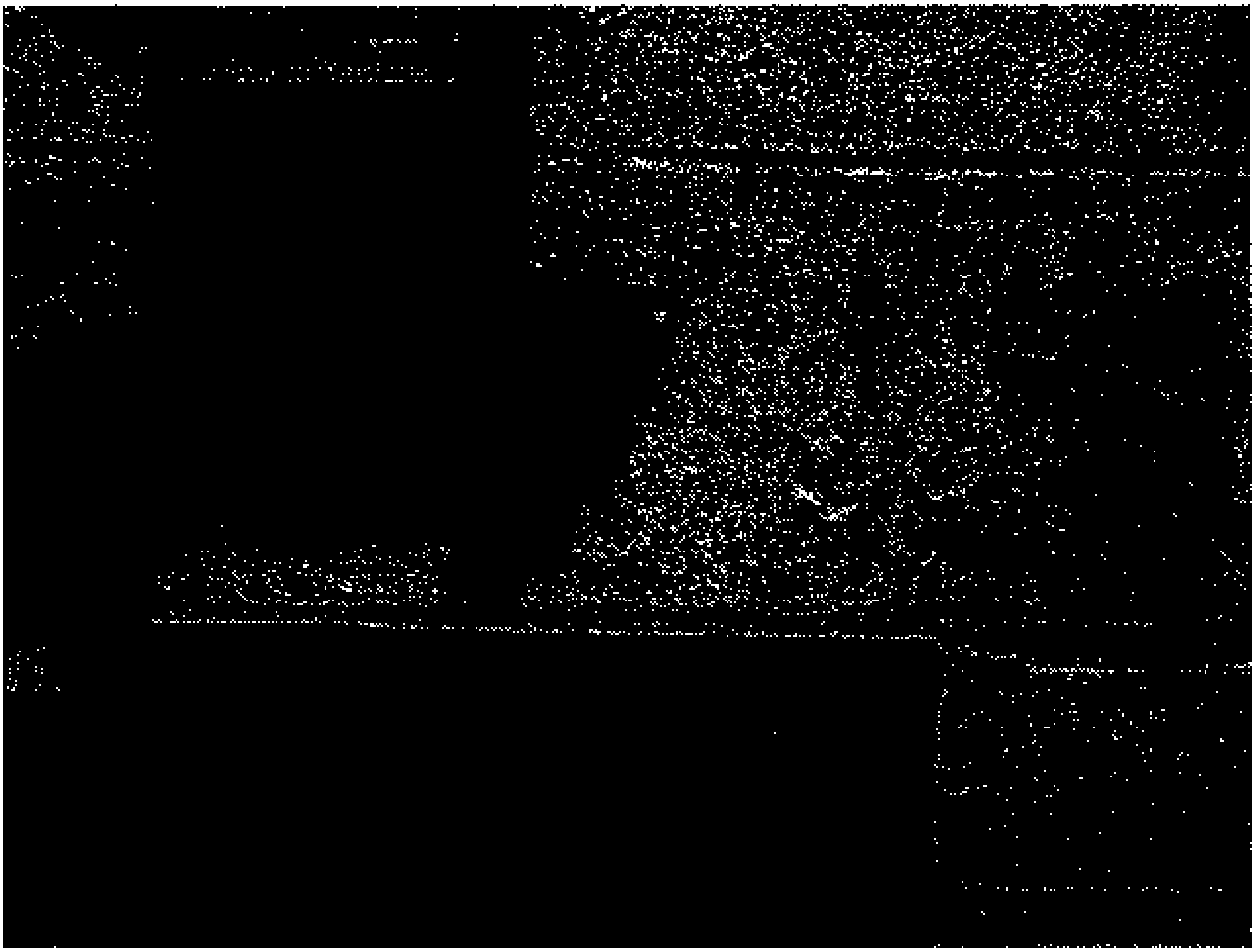

Annapolis MD
Drill Hall – Current Water Infiltration through Cement Block Wall, Chipping/Peeling Paint and Efflorescence

Annapolis MD
Gym Converted Firing Range

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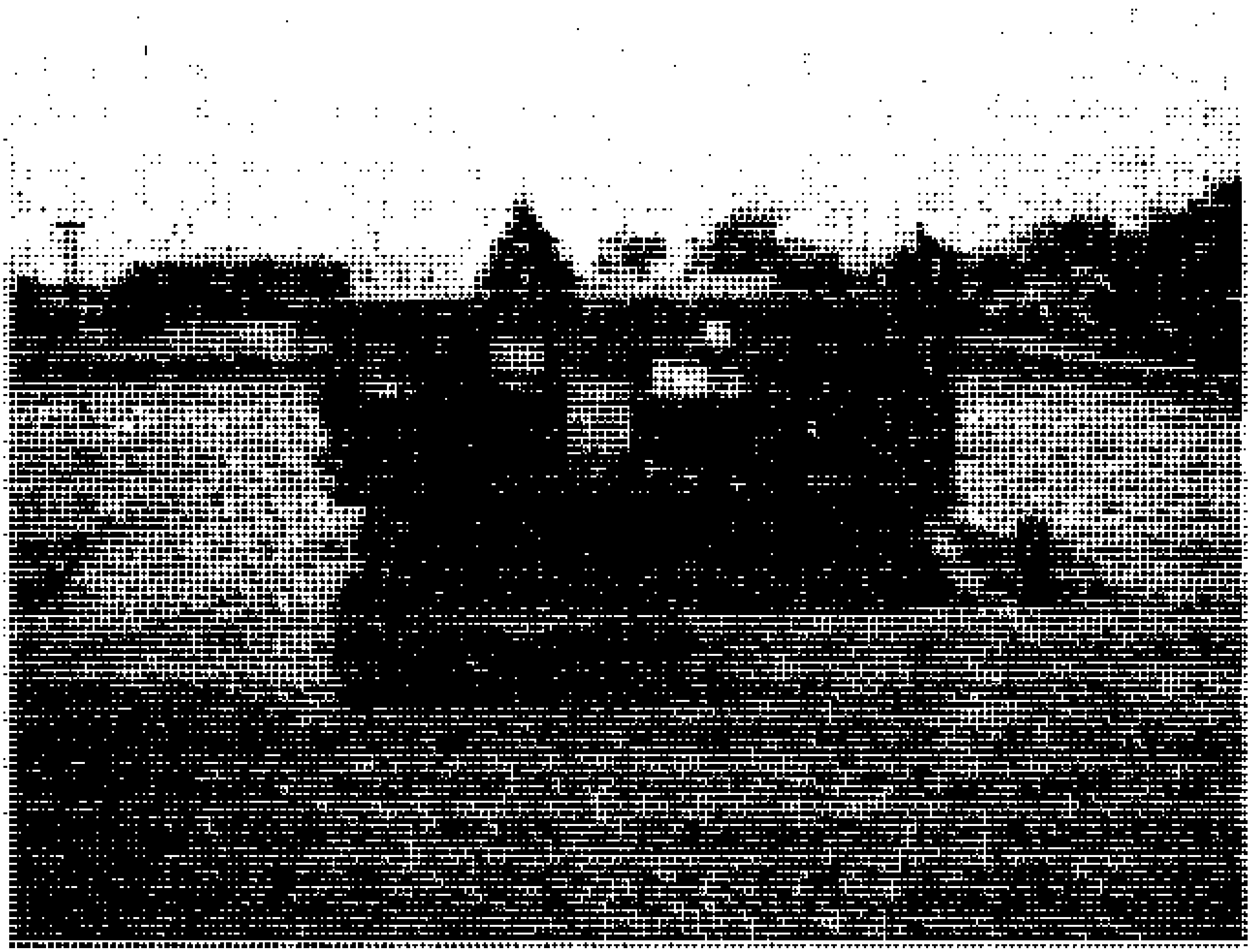
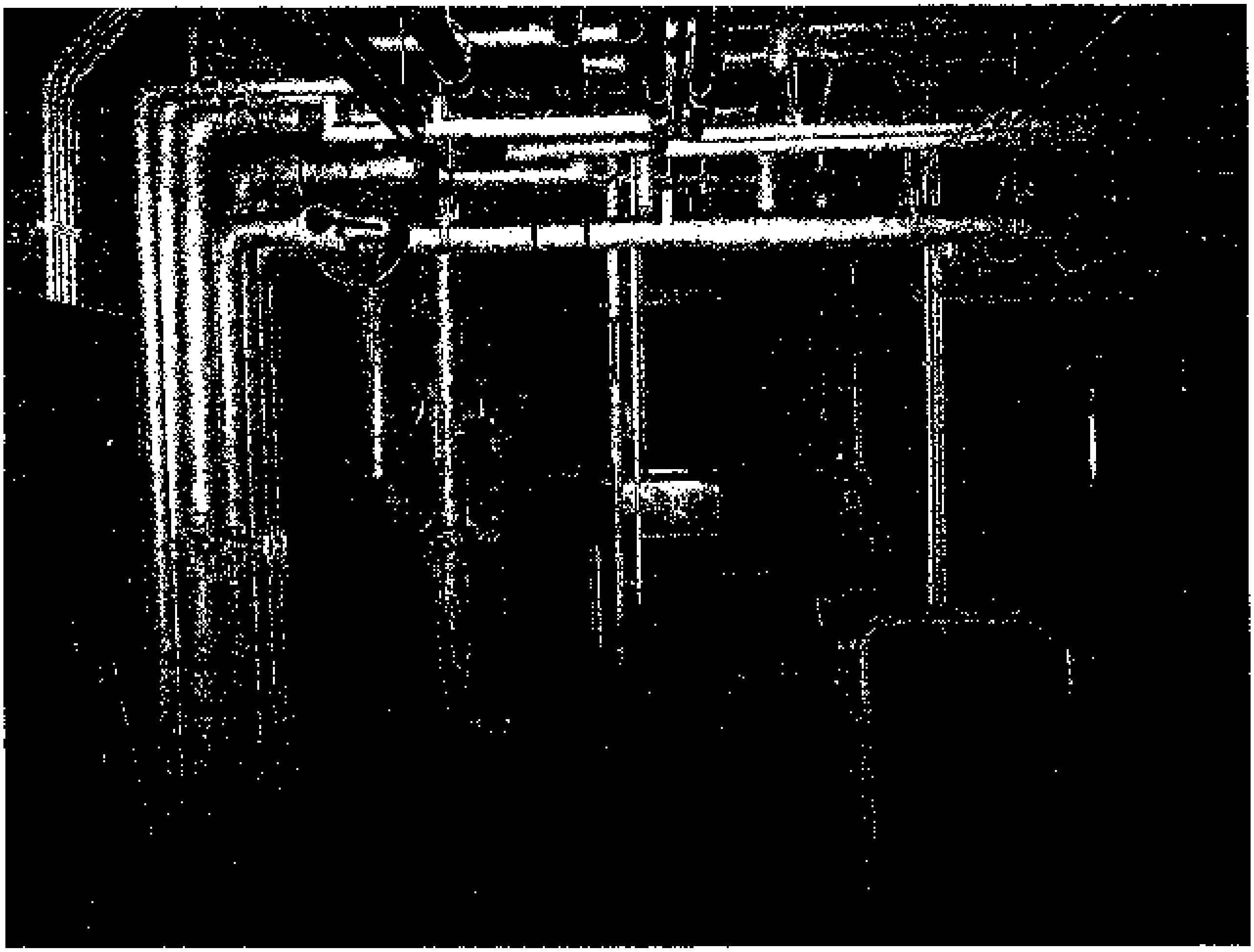


Rooftop Air Handling Unit



Annapolis MD
Boiler Room

Appendix C
Floor Plan

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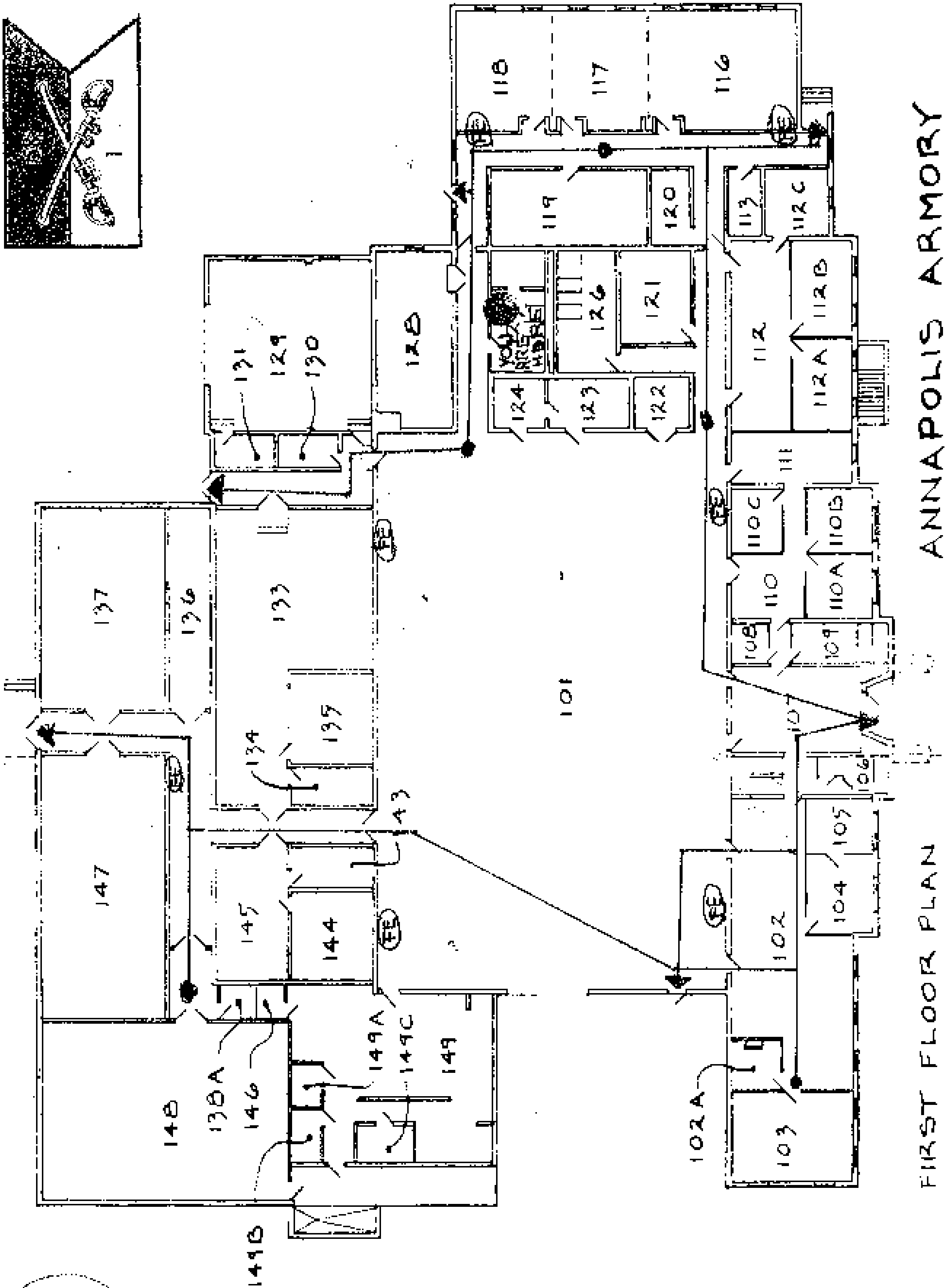
ANNAPOLIS ARMORY
FIRST FLOOR PLAN
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Appendix D
References

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Appendix D. References

1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead

2. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values and Biological Exposure Indices, 2010 Edition

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition

4. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007

5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

7. National Emission Standard Hazardous Air Pollutants (NESHAP) – The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

8. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h)(3)]

9. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

10. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation

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COMPLIANCE MANAGEMENT INTERNATIONAL

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Industrial Hygiene Survey Report

National Guard Facility
Annapolis Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Annapolis Readiness Center** **18 Willow Street** **Annapolis, MD 21401**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**June 20, 2013**
Report Date:	**July 30, 2013**

Non-Responsive
[redacted]

Manager, Industrial Hygiene Services

Table of Contents

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on June 20, 2013, at the Annapolis Readiness Center located 18 Willow Street, Annapolis, MD 21401. The survey was performed by Non-Responsive

1. Lead surface, bulk, and air samples were collected. All sample results were less than regulatory standards and/or recommended guidelines. See Section 3.0 for detailed sampling results.

2. Lighting levels met the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in all locations tested. See Section 4.0 for detailed findings.

3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.

    a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in two areas sampled.

    b. The relative humidity level was above the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in one occupied area sampled.

    c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 parts per million (ppm).

    d. Carbon dioxide (CO_2) levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings.

    See Section 5.0 for detailed sampling results.

4. Water-damaged walls were observed in the Drill Hall and Gym. See Section 5.0 for detailed findings.

5. The ground beneath the 2001 addition to the building is subsiding causing structural damage. See Section 5.0 for detailed sampling results.

6. No suspect asbestos containing material (ACM) was observed. See Section 6.0 for detailed sampling results.

7. This facility has a vehicle maintenance shop with an overhead vehicle exhaust system. See Section 7.0 for detailed sampling results.

Section 2.0 Operation Description & Observations

The Annapolis Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, attached vehicle maintenance shop and a converted firing range area (currently a Distance Learning Center). There were approximately 10 full-time employees stationed at this facility at the time of this survey.

The building is reported to have been built in 1959. It is a two-story structure with a basement. The exterior is brick and block. The interior walls are brick, block, plaster, and paneling with drywall in some of the offices. The floors are concrete, 12”x12” floor tiles and ceramic tile.

The heating system consists of a gas-fired steam generating unit. There is a roof-mounted central air-conditioning system.

There is no child-care facility in the building.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared to be properly designed. Personnel had supportive chairs.

This facility has a converted firing range (CFR) that is now used as a gym.

This facility has an attached 2-bay vehicle maintenance shop with an over head vehicle exhaust system. The overhead vehicle exhaust system has two connection points, both functional. The only PPE observed were gloves.

The ground beneath the 2001 addition is subsiding causing structural damage to the building walls and floor. It was reported that a local contractor is involved with corrective action.

Chipped and peeling paint was observed in the Drill Hall and Gym. Both areas were sampled for lead content.

Housekeeping seemed adequate.

No suspect asbestos containing material (ACM) was observed.

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Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 um mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	**Location**	**Bulk (%)**	**Air ug/m^3**	**Surface ug/ft^2**
1	Drill Hall	*	<5.1	*
2	Office 102	*	<5	*
3	Blank	*	<3 ug	*
4	Blank	*	*	<12 ug
5	Drill Hall Floor Center	*	*	<110
6	Drill Hall Wall Shelf	*	*	<110
7	Kitchen Microwave Top	*	*	<110
8	Kitchen Ice Machine Top	*	*	<110
9	CFR Floor	*	*	130
10	CFR Floor outside Entrance	*	*	<110
11	CFR Locker Top	*	*	<110
12	CFR Duct Top	*	*	<110
13	NCO Club Frig Top	*	*	<110
14	Office 110 Cabinet Top	*	*	<110
15	Office 207 Window Sill	*	*	<110
16	2nd Floor Cabinet Top	*	*	<110
17	Office 104 Bookshelf Top	*	*	<110
18	Office 102 File Cabinet Top	*	*	<110
19	Drill Hall Wall Paint Door 111	0.097	*	*
20	Gym Wall Paint	0.0072	*	*
-	**Criteria**	**0.5**	**50**	**200**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2 =** micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Sources:

1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges

2. OSHA 29CFR1910.1025 Lead Standard

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 “Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges” as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Lead surface, bulk and air samples were collected. The following is a summary of the sample results from this survey.

- Surface levels of lead were less than the recommended guideline of <200 ug/ft^2 in all locations sampled.

- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m^3).

- Two paint chip samples were collected. One from the Drill Hall wall above door to Office 111 where there is approximately 40 square feet of peeling paint. Another sample was collected from the Gym wall where there is approximately 30 square feet of damage. Both areas seem to be the result of water intrusion. These sample results was less than the EPA/U.S. Department of Housing and Urban Development (HUD) definition of lead based paint (0.5%). However, all areas of peeling paint should be repaired.

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Section 4.0 Lighting

A lighting assessment was conducted in this facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98011EL). The light meter was last calibrated in November 2012. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
158th Corridor	36.2	5	Yes
Women's Latrine	21.9	5	Yes
Lobby	32.2	10	Yes
Recruiting Office	67.0	30-50	Yes
Office 102	51.1	30-50	Yes
Office 104	76.5	30-50	Yes
Office 103A	78.5	30-50	Yes
Office 103B	61.0	30-50	Yes
Men's Latrine 106	34.7	5	Yes
Office 200	31.9	30-50	Yes
Conference 207 (meeting)	54.4	30	Yes
Drill Hall	30.0	10	Yes
Boiler Room 128	32.7	30	Yes
Boiler Room Corridor	27.0	5	Yes
Men's Latrine	41.1	5	Yes
Maintenance Corridor	18.4	5	Yes
Bulk Storage 133	23.5	10	Yes
Storage Corridor	34.1	5	Yes
Locker Room	18.2	7	Yes
Latrine 138A	32.3	5	Yes
Bulk Storage	19.3	10	Yes
Kitchen (prep)	66.0	50	Yes
Kitchen Office 149A	38.6	30-50	Yes
Office 119	37.3	30-50	Yes
Classroom 1	53.5	30-50	Yes
Comm. Room (not repair)	36.6	30-50	Yes
Office 112	33.2	30-50	Yes
Office 112A	55.7	30-50	Yes
Office 112C	63.3	30-50	Yes
Office 202	55.1	30-50	Yes

Table Notes:

1. FC = Foot Candles
2. **Bolded** results did not meet listed criteria

Source: ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

The lighting levels met the minimum recommended guideline in all areas measured.

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Section 5.0 Indoor Air Quality

Survey measurements were made for comfort parameters and ventilation (temperature, relative humidity, carbon dioxide, and carbon monoxide). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7575-X (Serial #1228008). The IAQ Meter was last calibrated in July 2012.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2010). ASHRAE specifies temperature ranges for human comfort (ASHRAE 55-2010). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60%.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	77.5	55.5	365	0.0
Office 102	77.8	57.4	640	0.6
Office 104	77.9	59.1	493	0.2
Office 205	74.9	50.8	455	0.4
NCO Club	74.4	**60.5**	507	0.0
Criteria	**68-79**	**30-60**	**<1,065**	**<9**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **°F =** degrees Fahrenheit

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

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Summary of findings and recommendations:

- Temperature measurements met the recommended 68-79°F in all occupied areas.

- Relative humidity levels were above the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 177 recommended guideline of 30-60% in one location. Relative humidity should be kept within the recommended guideline.

- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,065 ppm (700 ppm + 365 ppm). This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide

- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. The following observation were noted:

  1. Water-damaged walls were observed in the Drill Hall and Gym. This is apparently due to water intrusion from roof leaks above the Drill Hall and below-grade water intrusion in the Gym. Sources should be identified and corrected to ensure no further damage occurs.

  2. Structural damage (cracks in walls and floor) has occurred in the 2001 addition. This may provide pathways for air and water intrusion which could affect indoor air quality. A structural engineer or other qualified professional should be retained to identify and provide recommendations for corrective action.

Section 6.0 Suspect Asbestos Containing Building Materials (ACM)

No suspect ACM was noted at the time of this survey.

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

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Section 7.0 Ventilation Survey

This facility has a 2 bay attached vehicle maintenance shop with an over head vehicle exhaust system. The overhead vehicle exhaust system has two connection points, both were functional. The maintenance shop was reportedly only used occasionally during the winter months for minor vehicle maintenance such as oil changes. The only PPE observed were gloves.

Measurements were conducted at the face of the exhaust using a Velocicalc Plus Model 9555-P. Measurements were compared to the ACGIH Industrial Ventilation Manual requirements for above floor exhaust systems. The table below details measurement findings.

ABOVE FLOOR EXHAUST VENTILATION RATE SUMMARY

Location	Type of Hood	Exhaust Diameter	Measured Flow Rate (CFM)
Exhaust Left	Above Floor	6.0" x 3.5"	131
Exhaust Right	Above Floor	6.0" x 3.5"	125

Reference: Industrial Ventilation, A Manual of Recommended Practice for Design, 27th Edition, ACGIH.

EXAMPLES OF VEHICLE LEV SYSTEM REQUIREMENTS

Vehicle Nomenclature	Tailpipe Temp. (ºF)	Engine Displacement (ft3)	Engine RPM*	Exhaust Flow † (CFM)
M35A2, 2.5 Ton Cargo Truck	300	0.277	2,500	1,192
M1008 CUCV, SUV	267	0.219	3,800	1,370
M923A2, 5 Ton Cargo Truck	300	0.293	1,700	857
M996 HMMWV, All Terrain Vehicle	297	0.219	3,300	1,239

* Revolutions per Minute † Includes 20% Safety Factor

The actual flow rate that is required in an overhead vehicle exhaust system varies depending on the engine tail pipe temperature, whether or not the vehicle is "under load" or idling, engine displacement, engine size, etc. As an example, a 15 Liter Engine running at 1,000 rpm with an exhaust gas temperature of 1,300 F (heavy load) would require an exhaust flow of 2,110 CFM. If vehicle maintenance is performed at this facility we recommend the vehicle exhaust system be utilized. It should be regularly inspected to determine if it is operating as designed and meets the minimum requirements as recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation: A Manual of Recommended Practice for Design (27th Edition).

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Section 8.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98082EL	4/2013	NA
Velocicalc Plus	841015	8/12	N/A
SKC Air Sampling Pump	647631	6/17/13	2.47 LPM
SKC Air Sampling Pump	767971	6/17/13	2.48 LPM

Section 9.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

Appendix A. Laboratory Analysis Report

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	ARNG 4a MD	**Chain Of Custody:**	516192
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Annapolis	**Date Submitted:**	6/25/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	7/1/2013 **Report Date:** 7/1/2013
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
13073160	1	Flame	Air	593	N/A	5.1	ug/m³	<3	<5.1	ug/m³	
13073161	2	Flame	Air	595	N/A	5	ug/m³	<3	<5	ug/m³	
13073162	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13073163	4	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13073164	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073165	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073166	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073167	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073168	9	Flame	Wipe	****	0.108	110	ug/ft²	14	130	ug/ft²	
13073169	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073170	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073171	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073172	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073173	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073174	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073175	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073176	17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073177	18	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073178	19	Flame	Paint Chip	****	N/A	0.01	%Pb		0.097	%Pb	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #100470

Client:	National Guard Bureau	**Job Name:**	ARNG 4a MD	**Chain Of Custody:**	516192
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Annapolis	**Date Submitted:**	6/25/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	7/1/2013 **Report Date:** 7/1/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Total ug	Final Result	Comments
13073179	20	Flame	Paint Chip	****	N/A	0.0072 %Pb		0.011 %Pb	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)

%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: [redacted]

Technical Manager: [redacted]

An AIHA (#100470) and NY ELAP (#10920) Accredited Laboratory
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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **516192**

p1 of 2

Mailing/Billing Information:

1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:

1. Job Name: ARNG 4a MD
2. Job Location: ANNAPOLIS
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Pers[redacted] @ phone #: (410) 942-0273
5. Submitted b[redacted]ature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ Next Day ☐ 2 Day
☐ 3 Day ☒ ~~5 Day~~ Date Due: ~~NLT~~ 7/2/13
☐ Results Required By Noon Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ Email: [redacted] compliance place.com
☐ Fax: [redacted]us.army.mil
☐ Verbal [redacted]us.army.mil

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____(QTY)
☐ Fiberglass ____(QTY)

TEM Air – Please Indicate Filter Type:
☐ AHERA ____(QTY)
☐ NIOSH 7402 ____(QTY)
☐ Other (specify____) ____(QTY)

PLM Bulk
☐ EPA 600 – Visual Estimate ____(QTY)
☐ EPA Point Count ____(QTY)
☐ NY State Friable 198.1 ____(QTY)
☐ Grav. Reduction ELAP 198.6 ____(QTY)
☐ Other (specify____) ____(QTY)

MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____(QTY)
☐ NY State PLM/TEM ____(QTY)
☐ Residual Ash ____(QTY)

TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____(QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____(QTY)
☐ Quan. (s/area)Dust D6480-99 ____(QTY)

TEM Water
☐ Qual. (pres/abs) ____(QTY)
☐ ELAP 198.2/EPA 100.2 ____(QTY)
☐ EPA 100.1 ____(QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples ____°C)

Metals Analysis
☐ Pb Paint Chip 2 (QTY)
☐ Pb Dust Wipe (wipe type Ghost) 15 (QTY)
☐ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____(QTY)
☐ Pb TCLP ____(QTY)
☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Pb Furnace (Media ____) ____(QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ Spore-Trap ____(QTY) ☐ Surface Vacuum Dust ____(QTY)
☐ Surface Swab ____(QTY) ☐ Culturable ID Genus (Media____) ____(QTY)
☐ Surface Tape ____(QTY) ☐ Culturable ID Species (Media____) ____(QTY)
☐ Other (Specify____) ____(QTY)

LOT 3/23/12
EXP 9/15

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1	DRILL HALL	6/20/13	593					✓		✓						
2	OFFICE 102		595					✓		✓						
3	BLANK		—					✓		✓						
4	BLANK			—				✓				✓				
5	DRILL HALL FLOOR CENTER			100cm²				✓				✓				
6	DRILL HALL WALL SHELF							✓				✓				
7	KITCHEN MICROWAVE TOP							✓				✓				
8	KITCHEN ICE MACHINE TOP							✓				✓				
9	CFR FLOOR							✓				✓				
10	CFR FLOOR AT ENTRANCE							✓				✓				
11	CFR LOCKER TOP							✓				✓				
12	CFR DUCT TOP							✓				✓				

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 6 / 25 / 13 @ 940 Via: Fedex By (Print): [redacted] Sign: [redacted]
2. Date/Time Analyzed: ____/____/____ @ ____ By (Print):
3. Results Reported To: ____ Via: ____ Date: ____/____/____ Time: ____ Initials: ____
4. Comments:

OW (410) 247-2024 | 159202 | 210 REV. 6.08

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 516192 2 of 2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: ARNG 4aMD
2. Job Location: ANNAPOLIS
3. Job #: [redacted] P.O. #: W912K6-09-A-0003
4. Contact Perso[redacted] [redacted]3
5. Submitted by[redacted] ...nature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due: ______
☐ 24 Hours Time Due: ______
Comments: ______

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day +
☐ 2 Day Date Due: ______
☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

REPORT TO:
☒ Includ[redacted] with Report
☒ Email: [redacted] @compliaceplace.com
☐ Fax: @us.army.mil
☐ Verbal @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____(QTY)
☐ Fiberglass ____(QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____(QTY)
☐ NIOSH 7402 ____(QTY)
☐ Other (specify____) ____(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____(QTY)
☐ EPA Point Count ____(QTY)
☐ NY State Friable 198.1 ____(QTY)
☐ Grav. Reduction ELAP 198.6 ____(QTY)
☐ Other (specify____) ____(QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____(QTY)
☐ NY State PLM/TEM ____(QTY)
☐ Residual Ash ____(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____(QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____(QTY)
☐ Quan. (s/area)Dust D6480-99 ____(QTY)
TEM Water
☐ Qual. (pres/abs) ____(QTY)
☐ ELAP 198.2/EPA 100.2 ____(QTY)
☐ EPA 100.1 ____(QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____°C)

Metals Analysis
☐ Pb Paint Chip 2 (QTY)
☐ Pb Dust Wipe (wipe type CottoST) 15 (QTY)
☐ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____(QTY)
☐ Pb TCLP ____(QTY)
☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Pb Furnace (Media ____) ____(QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
☐ Spore-Trap ____(QTY) ☐ Surface Vacuum Dust ____(QTY)
☐ Surface Swab ____(QTY) ☐ Culturable ID Genus (Media____) ____(QTY)
☐ Surface Tape ____(QTY) ☐ Culturable ID Species (Media____) ____(QTY)
☐ Other (Specify____) ____(QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13 NCO CLUB	FRIG TOP	6/20/13		100cm²				✓				✓				
14 OFFICE	110 CAB TOP							✓				✓				
15 OFFICE 207	WINDOW SILL							✓				✓				
16 2ND FLR COM	MON CAB TOP							✓				✓				
17 OFFICE 104	Bookshelf TOP							✓				✓				
18 OFFICE 102	FILE CAB TOP							✓				✓				
19 ABOVE DOOR 111								✓			✓					
20 GYM WALL								✓			✓					

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:
[redacted]

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: ___/___/___ @____ Via: ____ By (Print): ____ Sign: ____
2. Date/Time Analyzed: ___/___/___ @____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ___/___/___ Time: ____ Initials: ____
4. Comments: ______

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Appendix B. Photographs

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Annapolis RC

Drill Hall Open Garage Door

Chipped Paint above Door 111 in Drill Hall

Chipped Paint on Gym Wall

Damaged Caulking on Front Steps

Vehicle Exhaust System

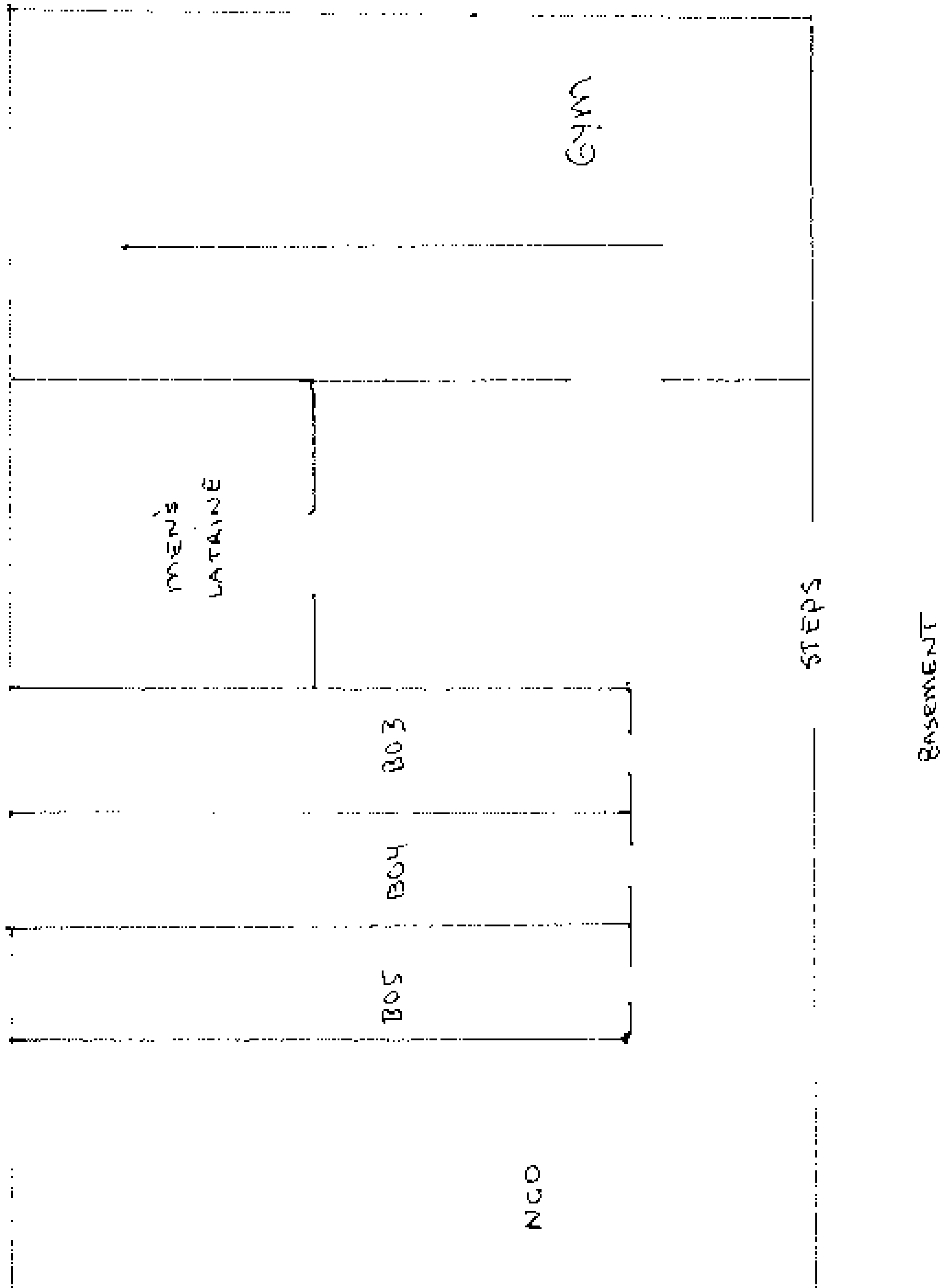
Structural Damage to Walls of New Addition

More Structural Damage to Walls of New Addition

Structural Damage to New Addition Floor

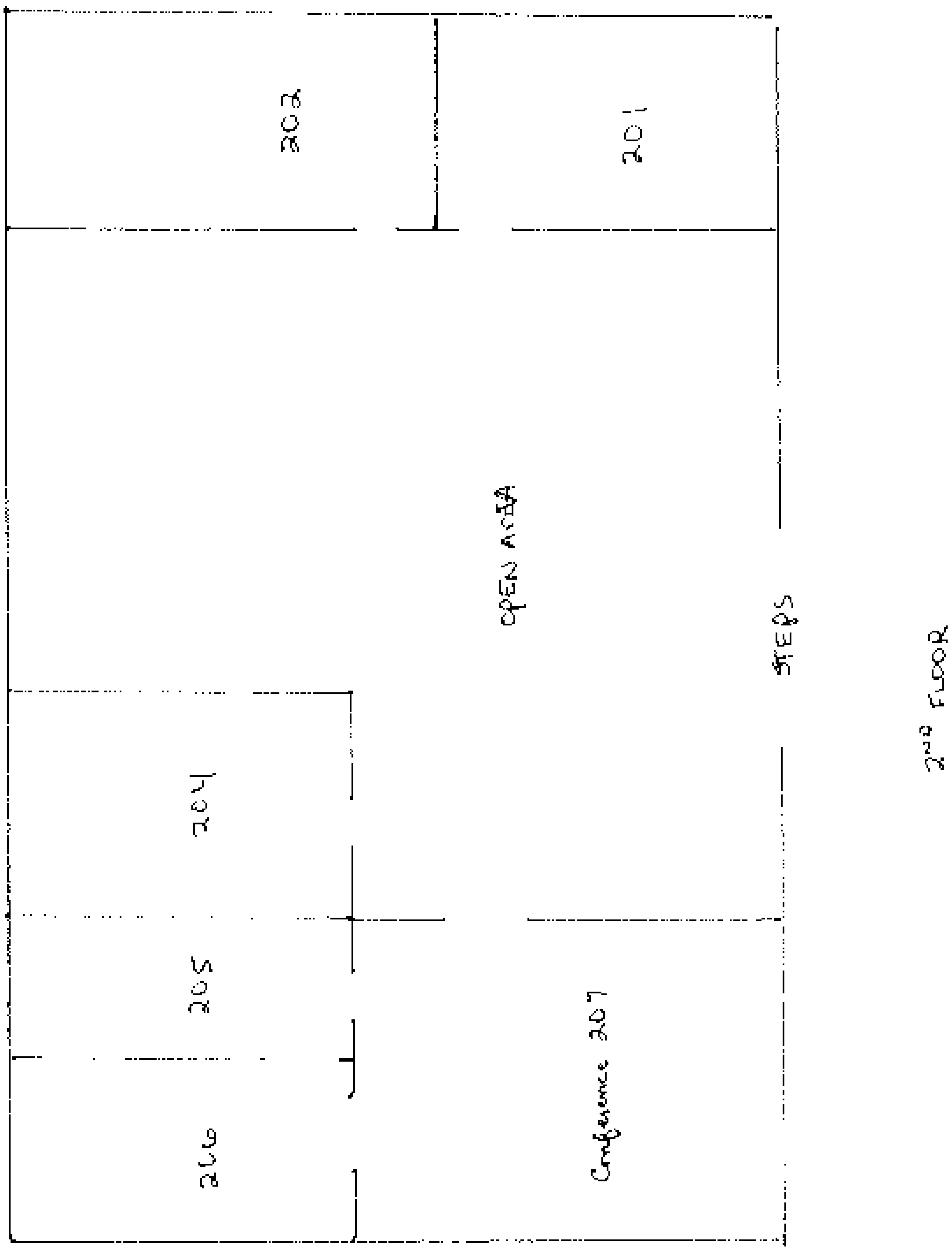
Appendix C. Floor Plan

ANNAPOLIS RC



BEST AVAILABLE COPY

Annapolis RC
6/20/13



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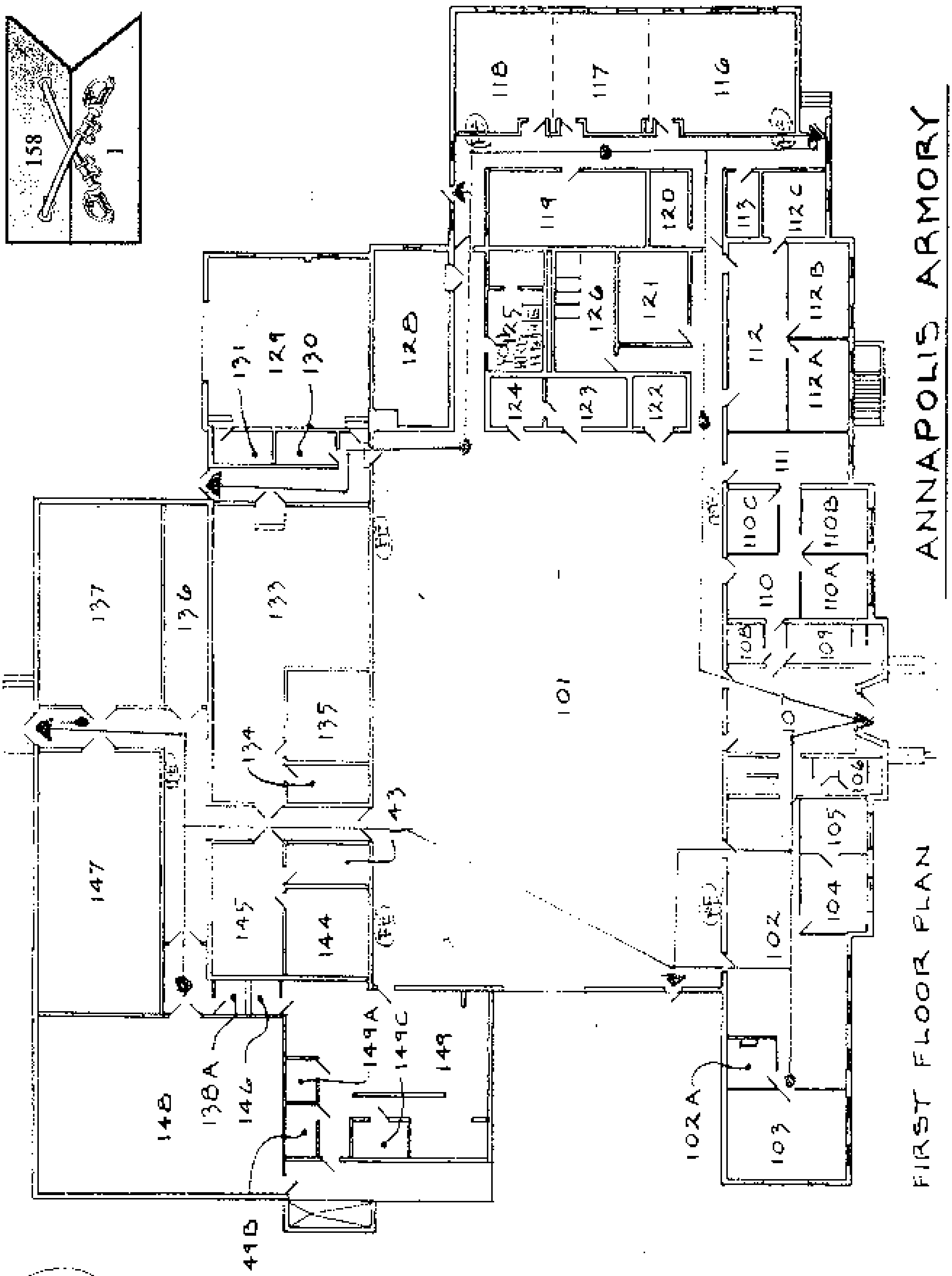
ANNAPOLIS ARMORY
FIRST FLOOR PLAN
158
1

Appendix D. References

1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead.

2. American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2011 Edition.

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition.

4. American National Standards Institute (ANSI) /American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2010.

5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.

6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.

7. National Emission Standard Hazardous Air Pollutants (NESHAP) – The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

8. National Ambient Air Quality Standards (NAAQS) - National primary ambient air quality standards for carbon monoxide 40 CFR 50.8.

9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227 (h) (3)].

10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM).

11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.

12. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.

13. ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

MEMORANDUM FOR Region North Industrial Hygiene Office (NGB-AVS-SI-IH/ Ms. [redacted], Army National Guard Bureau, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, MG Boyd M Cook Armory, Cascade, MD, Project No. 55-ML-01ED-03/05

1. Enclosed is the final copy of the subject report and two CD-ROMs.

2. The project number for this service reflects the current fiscal year of dispatch and the actual field work which was completed for fiscal year 2003. The State of Maryland Army National Guard occupational health nurse was immediately notified in writing of findings necessitating immediate corrective action in Maryland armories. In addition, the National Guard Bureau Region North Industrial Hygiene Office has been notified of all the results of lead in dust sampling conducted in all facilities. Draft reports were reviewed by you or other members of the National Guard and members of this Center, including our editorial staff, during drafting stages in report preparation leading up to the final report.

3. Our point of contact is Ms. [redacted] at commercial 410-436-5475/3118, DSN 584-5475/3118, or electronic mail: [redacted]@us.army.mil

FOR THE COMMANDER:

[redacted]

Encl

Director, Occupational Health Sciences

Readiness thru Health

U.S. Army Center for Health Promotion and Preventive Medicine

USACHPPM

CONSERVARE SALUTEM

MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEYS
MG BOYD M. COOK ARMORY, FORT RITCHIE
CASCADE, MD
PROJECT NO. 55-ML-01ED-03/05
12 AUGUST 2003

Approved for public release; distribution unlimited

CHPPM FORM 432-E (MCHB-CS-IPD), OCT 03

Readiness Thru Health

U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed $3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- ♦ *Integrity is the foundation*
- ♦ *Excellence is the standard*
- ♦ *Customer satisfaction is the focus*
- ♦ *Its people are the most valued resource*
- ♦ *Continuous quality improvement is its pathway*

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

CHPPM FORM 432-E (MCHB-CS-IPD), OCT 03 *(reverse)*

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEYS
MG BOYD M. COOK ARMORY,
CASCADE, MD
PROJECT NO. 55-ML-01ED-03/05
12 AUGUST 2003

1. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard facilities to identify and measure the existence and extent of potentially hazardous operations or conditions. This survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee for the Defense Occupational and Environmental Health Readiness System.

2. CONCLUSIONS.

a. Lead in Dust. Levels of lead in dust that exceeded safe limits for children and adults were found in the armory. These levels may result in health hazards to employees and to children visiting the armory.

b. Safety Hazards. The leaking roof has caused damage to ceiling tiles. Employees are exposed to potential hazards from falling ceiling tiles or a collapsing ceiling, and to slip hazards from water on the floor.

c. Mold Exposure. Excessive moisture in the armory has caused mold growth. Mold exposure may cause illness in armory employees.

d. Ventilation. The exhaust fans were not working in the latrines and the locker rooms, and some exhaust fans may have never been installed. The ventilation may cause indoor air quality complaints.

3. RECOMMENDATIONS. The Department of Defense Instruction 6055.1 provides Risk Assessment Codes (RACs) for health hazards, a procedure which allows assessment of the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and

Readiness thru Health

combines the hazard severity and accident probability into a single number. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

a. Lead Exposure. Health Hazard RAC 3 for adults. Health Hazard RAC 2 for children.

(1) Develop and implement a Lead Hazard Management Plan for the facility. Sample rooms adjacent to Indoor Firing Range (IFR) bullet trap area. Personnel working in the former IFR area were tracking lead out of the area and redistributing lead into adjacent rooms in the armory

(2) Restrict access to the former IFR (current storage room) by keeping it locked, until the facility can be cleaned. Post a sign warning against use of this room for storage or entry except in an emergency.

(3) If access to the storage room is not restricted, wear disposable gloves and coveralls as extra protection when working in areas identified as having elevated levels of lead.

(4) Discontinue advertising this facility for use by young children. Address all potential lead hazards before continuing to extend use of this facility to children. Clean the floor (s) in areas used by children to the Environmental Protection Agency lead in dust standards for young children, and clean other horizontal surfaces in areas used by children to the National Guard Bureau (NGB) Region North and U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) decontamination level for lead in dust on frequently contacted surfaces. Clean the administrative area horizontal surfaces that have elevated lead levels to the NGB Region North and USACHPPM recommended safe limit for floors and frequently contacted surfaces. See Appendix E for Lead cleaning guidance.

(5) Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements.

b. Safety Hazards. Safety Hazard RAC 3. Repair the roof leak and replace damaged ceiling tiles. The leaks should be inspected and repaired by a professional roofing contractor.

c. Mold Exposure. Health Hazard RAC 4. Remove and replace ceiling tiles with mold growth. Abate all areas of visible mold. For additional guidance on moisture control and mold remediation in the armory refer to USACHPPM TG 278, Industrial Hygiene/Preventive Medicine Mold Assessment Guides, and USACHPPM TG 277, Army Facilities Management Information Document on Mold Remediation Issues in Appendix F.

d. Ventilation. Health Hazard RAC 4. Investigate operating problems with air handling systems. Consider resurveying indoor air conditions in hot weather with system fully operational.

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MDARNG Facilities IH Baseline Surveys MG Boyd M. Cook Armory, Cascade, MD, Project No. 55-ML-01ED-03/05

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEYS
MG BOYD M. COOK ARMORY
CASCADE, MD
PROJECT NO. 55-ML-01ED-03/05
12 AUGUST 2003

1. REFERENCES. See Appendix A.

2. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard facilities to identify and measure the existence and extent of potentially hazardous operations or conditions. This survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee for the Defense Occupational and Environmental Health Readiness System.

3. AUTHORITY. Fax, National Guard Bureau (NGB) Region North Industrial Hygiene Office (NGB-AVS-SI-IH/Ms. [redacted]), 28 February 2003, subject: SAB.

4. BACKGROUND INFORMATION.

a. Armory Mission and Units. The armory mission is long range surveillance. The resident units include the Detachment 1, Company B, 129th Signal Battalion; Detachment 1, Company B, 1st Battalion, 115th Infantry Regiment; Company E, 629th Military Intelligence Battalion; and 129th Infantry Detachment.

b. Date of Construction. The date of construction of the building is 1994.

c. Armory Use by Children. The points of contact (POCs) stated that children occupy the armory during family support group activities, including Christmas dinners. The Maryland Military Department is currently advertising MG Boyd M. Cook Armory as available for rental for activities that include young children.

d. POCs. SFC [redacted] and SFC [redacted] MG Boyd M. Cook Armory, 13817 Ritchie Road, Cascade, MD 21719.

Readiness thru Health

5. PHOTOGRAPHS. See Appendix B.

6. FACILITY EVALUATION.

a. Sampling Locations and Results. Samples were collected for lead on surfaces, (wipe samples), to determine the presence of lead hazards. Lead sample results and locations are shown in Appendix C.

b. Paint. A POC stated that there was no lead-based paint in the facility. The age of the buildings indicated that the presence of lead-based paint was unlikely.

c. Asbestos. A POC stated that there was no asbestos in the facility. The age of the building indicated that the use of asbestos-containing building material was unlikely.

d. Building Physical Condition. There was structural damage on the wall in Room 111 due to the building settling. SFC Agnew said that building engineers and facility managers had evaluated the facility and stated that the building was still settling and this damage did not pose a safety hazard. The armory roof was flat, and a POC reported that it leaked when it rained. At the time of the survey there was leaking water around all the roof drains.

e. Safety Hazards. The facility was aging and the roof had leaked for several years.

f. Mold and Moisture Problems (Photographs 1488 and 1493, Appendix B). There was mold growth on ceiling tiles due to a leaking roof. There were also water damaged ceiling tiles in the office area and hallway near Room 110.

g. Indoor Firing Range. The indoor firing range (IFR) had been converted to a parachute storage room. Lead contamination was reported to have been abated.

h. Safety and Occupational Health Programs. There were no safety or occupational health program documents available in the armory.

i. Heating, Ventilation, and Air-Conditioning Systems. There was central heating and air-conditioning. The building was heated with steam heat. At the time of the survey the air conditioning was not working. The exhaust fans in the male and female latrines and the locker rooms were not working. Ventilation measurements were not in the scope of the survey.

j. Indoor Firing Range. The IFR had been closed, all lead abated, and cleaned.

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k. Noise Dosimetry. No operations with the potential to generate hazardous noise levels were identified.

l. Lighting. All areas were visually judged to be adequately lit.

7. ASSESSMENT CRITERIA FOR LEAD. See Appendix D for details.

a. Lead in Air. The Army complies with the Occupational Safety and Health Administration 8-hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter ($\mu g/m^3$) of air.

b. Lead in Dust. The Environmental Protection Agency (EPA) and State of Maryland limits for lead in dust are 40 micrograms per square foot ($\mu g/ft^2$) on floors, 250 $\mu g/ft^2$ on window sills, and 400 $\mu g/ft^2$ in window troughs. These limits apply to pre-1978 Army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The NGB Region North concurs with the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended safe limit of 200 $\mu g/ft^2$ on floors and frequently contacted surfaces, which is more stringent for window sills than the EPA/State standards.

c. Lead in Paint. Paint containing lead levels of 0.5 percent or more by weight in dried solid (also reported as 5000 milligrams per kilogram) is considered to be lead-based paint according to regulations. Paint containing lead levels of more than 0.7 milligrams per square centimeter is considered to be lead-based paint according to Maryland State Regulations. In Army Regulation 420-70, Buildings and Structures, lead-contaminated paint is defined as any paint containing detectable amounts of lead. The Army considers lead-contaminated paint to be potentially hazardous to children if it is disturbed or deteriorating.

d. Lead Carcinogenicity. The Department of Health and Human Services National Toxicology Program (NTP) released the Report on Carcinogens, Eleventh Edition in February 2005. The NTP report lists “lead and lead compounds” as “reasonably anticipated to be human carcinogens”.

8. SAMPLING RESULTS, DISCUSSION, AND CONCLUSIONS.

a. Paint. The paint was intact and in good condition.

b. Lead in Dust. Lead in dust sample locations and analytical results are shown in the report Table below. Levels of lead in dust that exceeded safe limits for children and adults were identified in the former IFR bullet trap. One lead in dust wipe sample result had extremely high levels of lead and exceeded the NGB Region North and USACHPPM recommended decontamination levels and the EPA lead exposure level for children, indicating that the IFR had not been completely cleaned. Personnel in this room are potentially exposed to lead, and are tracking lead out of the area and redistributing lead into adjacent rooms in the armory. This can result in lead exposures for children visiting this facility and for the general workforce.

TABLE. Lead in Surface Dust Wipe Locations and Analytical Results.

Wipe Sample #	Locations of Samples	Conc. (µg/ft²)
CDW01	Former IFR bullet trap area	2909
CDW02	Former IFR midway on floor near sleeping area	<23
CDW03	Floor near exit door to outside	<23
CDW04	Floor about one foot from entrance door to new tile floor	<23

9. RECOMMENDATIONS. The Department of Defense Instruction 6055.1 provides Risk Assessment Codes (RACs) for health hazards, a procedure which allows assessment of the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and combines the hazard severity and accident probability into a single number. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

a. <u>Lead Exposure</u>. Health Hazard RAC 3 for adults. Health Hazard RAC 2 for children.

(1) Develop and implement a Lead Hazard Management Plan for the facility. Sample areas adjacent to the IFR bullet trap area.

(2) Restrict access to the former IFR (current storage room) by keeping it locked, until the facility can be cleaned. Post a sign warning against use of this room for storage or entry except in an emergency.

(3) If access to the storage room is not restricted, wear disposable gloves and coveralls as extra protection when working in areas identified as having elevated levels of lead.

(4) Discontinue advertising this facility for use by young children. Address all potential lead hazards before continuing to extend use of this facility to children. Clean the floor (s) in areas used by children to the EPA lead in dust standards for young children, and clean other horizontal surfaces in areas used by children to the NGB Region North and USACHPPM decontamination level for lead in dust on frequently contacted surfaces. Clean the administrative area horizontal surfaces that have elevated lead levels to the NGB Region North and

USACHPPM recommended safe limit for floors and frequently contacted surfaces. See Appendix E for Lead cleaning guidance.

(5) Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements.

b. Safety Hazards. Safety Hazard RAC 3. Repair the roof leak and replace damaged ceiling tiles. The leaks should be inspected and repaired by a professional roofing contractor.

c. Mold Exposure. Health Hazard RAC 4. Remove and replace ceiling tiles with mold growth. Abate all areas of visible mold. For additional guidance on moisture control and mold remediation in the armory refer to USACHPPM TG 278, Industrial Hygiene/Preventive Medicine Mold Assessment Guides, and USACHPPM TG 277, Army Facilities Management Information Document on Mold Remediation Issues in Appendix F.

d. Ventilation. Health Hazard RAC 4. Investigate operating problems with air handling systems. Consider resurveying indoor air conditions in hot weather with systems fully operational.

10. ADDITIONAL ASSISTANCE. For additional assistance, or questions concerning this report, please contact the undersigned at DSN 584-3118, commercial 410-436-3118, or by Electronic to: [redacted]@us.army.mil

[redacted]
Industrial Hygienist
USACHPPM Lead and Asbestos Team Leader
Industrial Hygiene Field Services Program

APPROVED:

[redacted]
Technical Program Manager
Industrial Hygiene Field Services Program

APPENDIX A

REFERENCES

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APPENDIX A

REFERENCES

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10. OSHA Instruction, CPL 02-02-058 - CPL 2-2.58 - 29 CFR 1926.62, Lead Exposure In Construction; Interim Final Rule-- Inspection and Compliance, Procedures, 1993.
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11. U.S. Department of Housing and Urban Development (HUD), Technical Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing 1998.
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APPENDIX B

PHOTOGRAPHS

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MG Boyd M. Cook Armory, Cascade, MD Armory Photographs

Photograph Number	Location
1488	Mold growth on ceiling tile
1489	Former IFR bullet trap/Lead in dust sampling/ high levels of lead
1490	Former IFR midway on floor near sleeping area/ Lead in dust sampling
1491	Exit door floor area/ Lead in dust sampling
1492	Floor one foot from entrance door to new tile floor/ Lead in dust sampling
1493	Dining area/ Mold on ceiling
1494	Room 11 structural damage
1495	Water damaged tiles in office area and hallway near Room 110

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CHUTE PAK

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Entertainment Series
SONY


FIRE
ALARM
PULL DOWN

APPENDIX C

SAMPLING SHEETS AND LAB ANALYSES

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Lead Sample Results for Cascade

Wipe Sample #	Armory	City	Indoor Range Info: Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (µg/ft²)
			No			Yes		
CDW01	Cascade	Ft. Ritchie					Former IFR baffle	2909
CDW02	Cascade	Ft. Ritchie					Former IFR midway on floor near sleeping area	<23
CDW03	Cascade	Ft. Ritchie					Floor near Exit Door to outside	<23
CDW04	Cascade	Ft. Ritchie					Floor about one foot from entrance door to new tile floor	<23

Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211
(303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

August 25, 2003

Laboratory Code:	**RES**
Subcontract Number:	**NA**
Laboratory Report:	**RES 96610-1**
Project Description:	**None Given Cascade MD and Anapolis MD**

[redacted]
Army National Guard IH - West
3401 Quebec Street, Suite 7200
Denver CO 80207

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association, Lab ID 101533 - Accreditation Certificate #480. The laboratory is currently proficient in both PAT & ELPAT programs respectively.

Reservoirs has analyzed the following sample(s) using Atomic Emission Spectroscopy - Inductively Coupled Plasma (AES-ICP) per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the analysis table. Results have been sent to your office.

RES 96610-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you should have any questions about this report, please feel free to call me at 303-964-1986.

Sincerely,

[redacted]

President

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RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD BY WIPE SAMPLING

RES Job Number:	**RES 96610-1**
Client:	**Army National Guard IH - West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**Cascade MD and Anapolis MD**
Date Samples Received:	**August 19, 2003**
Analysis Type:	**USEPA SW846 3050B / AA(7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 22, 2003**

Client ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
CDBLANK1	EM 806468	0.11	BDL	23	BDL
CDW01	EM 806469	0.11	320.0	23	2909
CDW02	EM 806470	0.11	BDL	23	BDL
CDW03	EM 806471	0.11	BDL	23	BDL
CDW04	EM 806472	0.11	BDL	23	BDL
APBLANK1	EM 806473	0.11	BDL	23	BDL
APW01	EM 806474	0.11	5.0	23	45
APW02	EM 806475	0.11	17.0	23	155
APW03	EM 806476	0.11	BDL	23	BDL

***Calculations Based On A 1 sq.ft. Sample Area Unless Otherwise Noted**

BDL = Below Detection Limit

Data Qa

Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211
(303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

August 25, 2003

Laboratory Code:	**RES**
Subcontract Number:	**NA**
Laboratory Report:	**RES 96610-1**
Project Description:	**None Given Cascade MD and Anapolis MD**

[redacted]
Army National Guard IH - West
3401 Quebec Street, Suite 7200
Denver CO 80207

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association, Lab ID 101533 - Accreditation Certificate #480. The laboratory is currently proficient in both PAT & ELPAT programs respectively.

Reservoirs has analyzed the following sample(s) using Atomic Emission Spectroscopy - Inductively Coupled Plasma (AES-ICP) per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the analysis table. Results have been sent to your office.

RES 96610-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you should have any questions about this report, please feel free to call me at 303-964-1986.

Sincerely,

[redacted]

President

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APPENDIX D

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE

ASSESSMENT CRITERIA FOR LEAD

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SUBJECT: National Guard Bureau Region North Industrial Hygiene Office
Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 $\mu g/ft^2$. This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. The EPA standards (40 CFR 745.227(e) (8) (viii)) and State of Maryland standards are not directly applicable because they are developed for floors (40 $\mu g/ft^2$), windowsills (250 $\mu g/ft^2$)and window troughs (400 $\mu g/ft^2$) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. The OSHA has no specific requirement for work area surfaces. The OSHA lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. The OSHA cites a level of 200 $\mu g/ft^2$ in OSHA Instruction CPL 2-2.58 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 $\mu g/ft^2$ is a safe surface contamination level for adult exposures. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels higher than those recommended above do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All States will receive this guidance when it is completed.

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 50 $\mu g/m^3$ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

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APPENDIX E

LEAD CLEANING GUIDANCE

HUD TECHNICAL GUIDELINES FOR THE EVALUATION AND CONTROL OF LEAD-BASED PAINT HAZARDS IN HOUSING 1998

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CHAPTER 14: CLEANING

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.

2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.

3. Have sufficient cleaning equipment and supplies *before* beginning work.

4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.

5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.

6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.

7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.

8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.

9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.

10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.

11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.

12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.

13. Paint or otherwise seal treated surfaces and interior floors.

14. Conduct a clearance examination (see Chapter 15).

15. If clearance is not achieved, repeat the final cleaning.

16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.

17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.

18. Cleaning equipment list:

    - HEPA vacuums.
    - Detergent.
    - Waterproof gloves.
    - Rags.
    - Sponges.
    - Mops.
    - Buckets.
    - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
    - 6-mil plastic bags.
    - Debris containers.
    - Waste water containers.
    - Shovels.
    - Rakes.
    - Water-misting sprayers.
    - 6-mil polyethylene sheeting (or equivalent).

Chapter 14: Cleaning

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris *and* dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?
- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

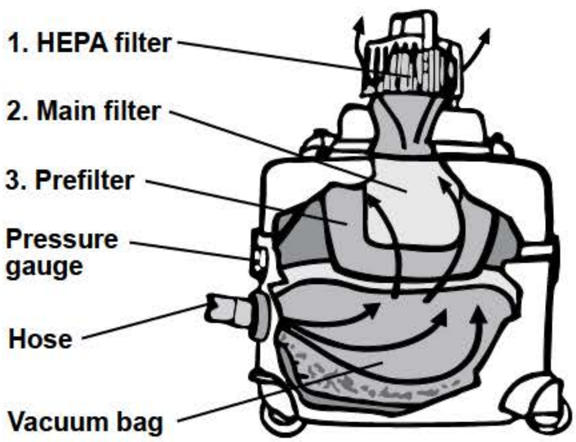
To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards *and* were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and pre-filter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the pre-filter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

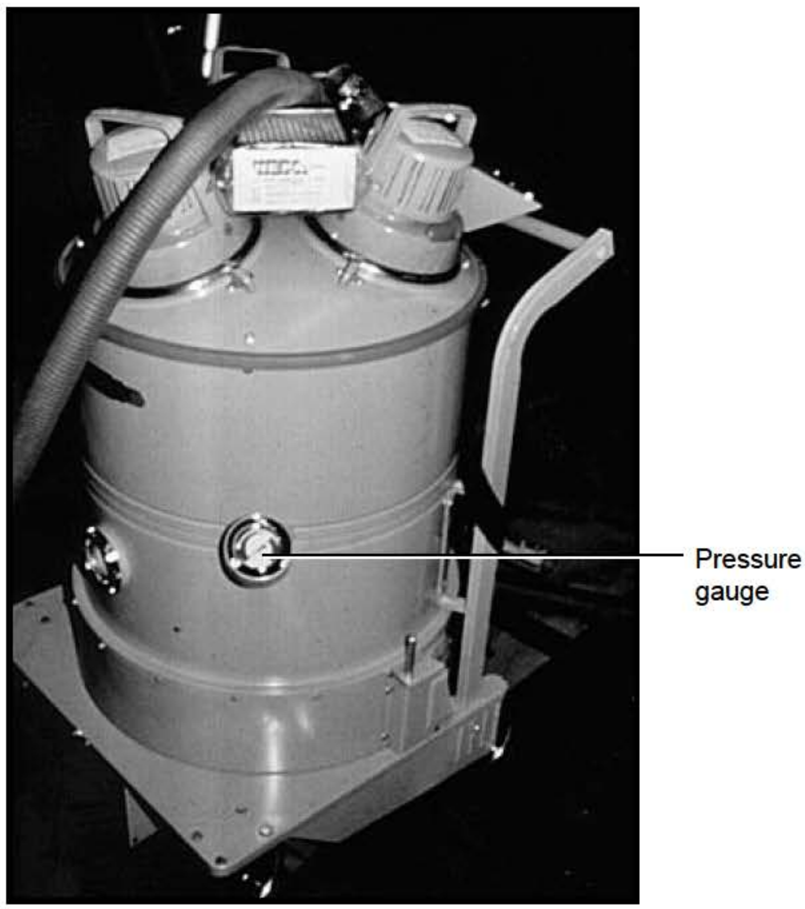
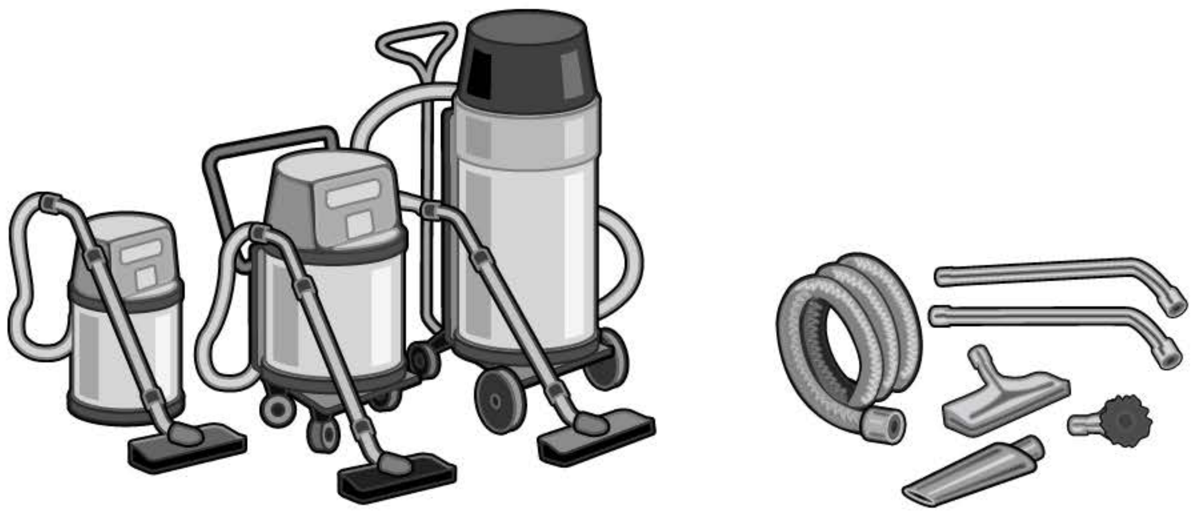


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

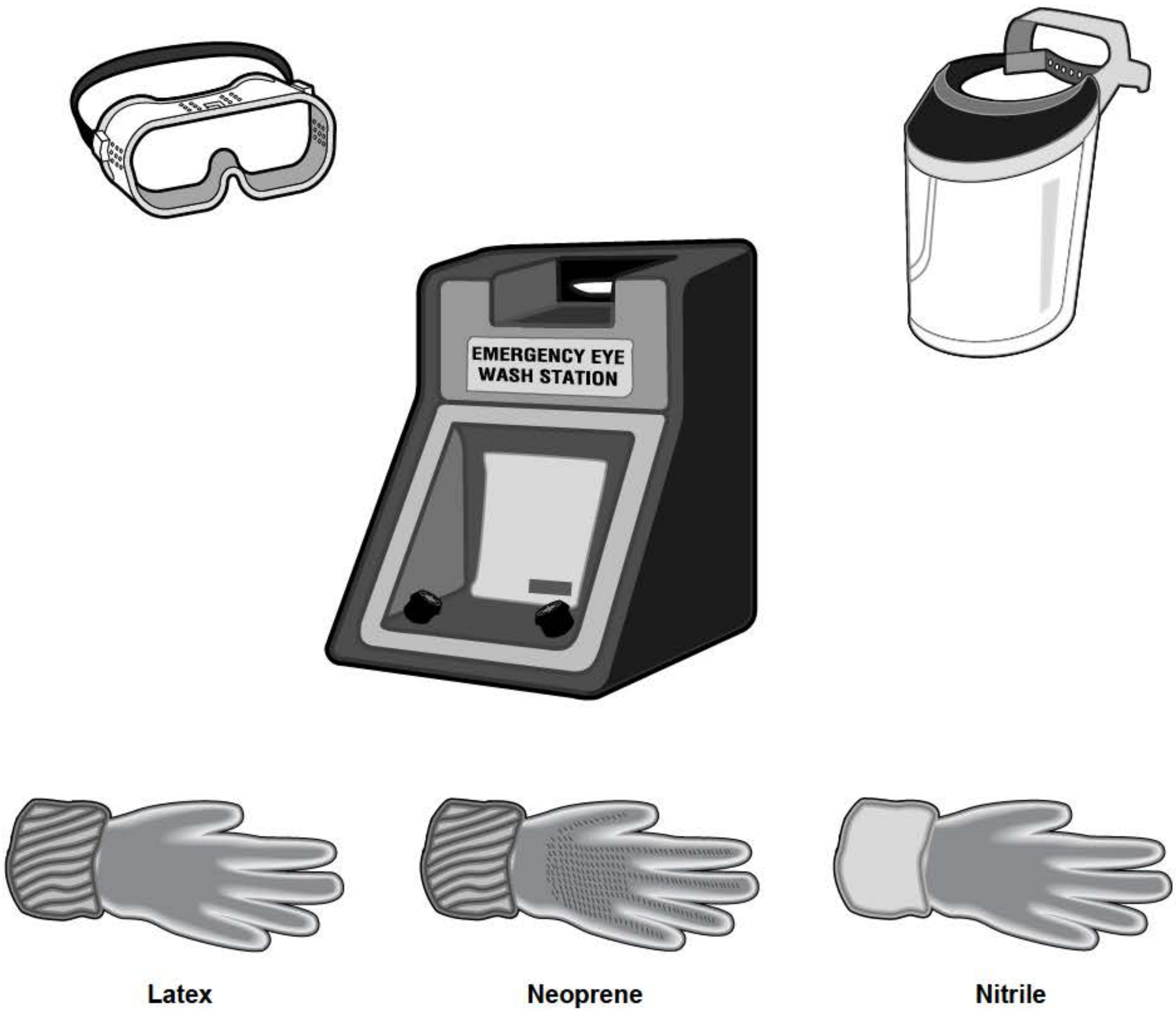
Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

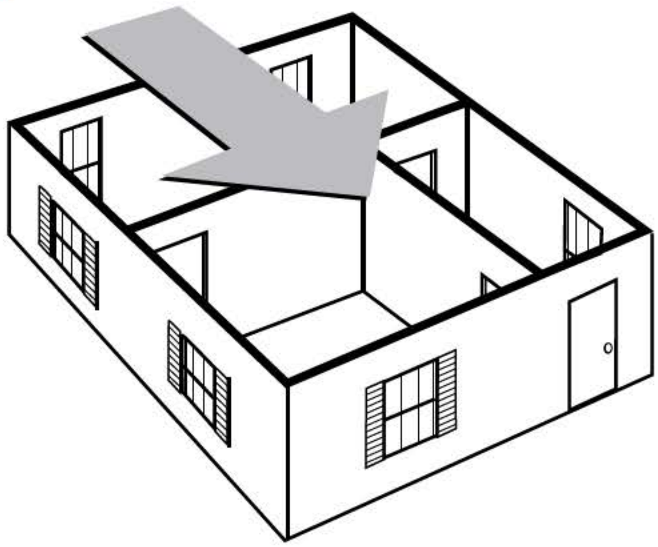
Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

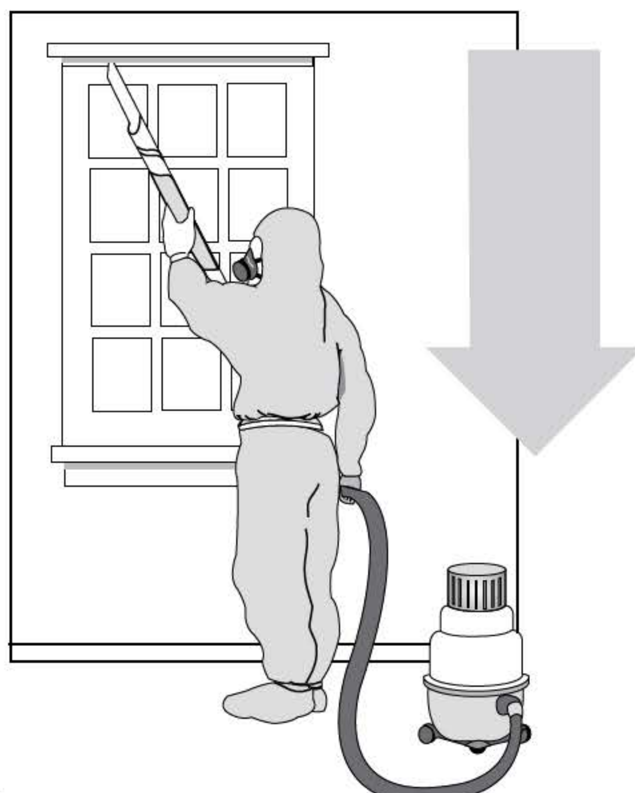
- First, the area is HEPA vacuumed.

Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the wood-work, and so on, and work down to the floor. Do every inch of the win-dows, especially the window troughs.



Courtesy: Alice Hamilton Occupational Health Center

- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

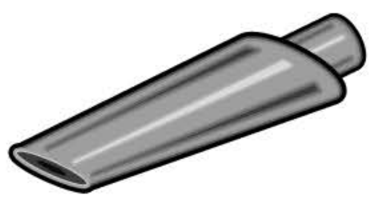
Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.



Rubber Cone

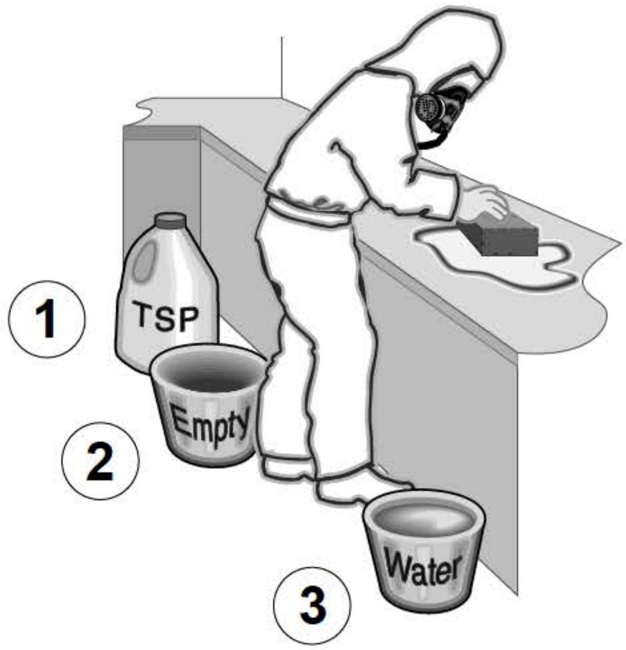
Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

Figure 14.4c (continued)

Wash all surfaces with suitable detergents
Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces

Wet Mop Floor

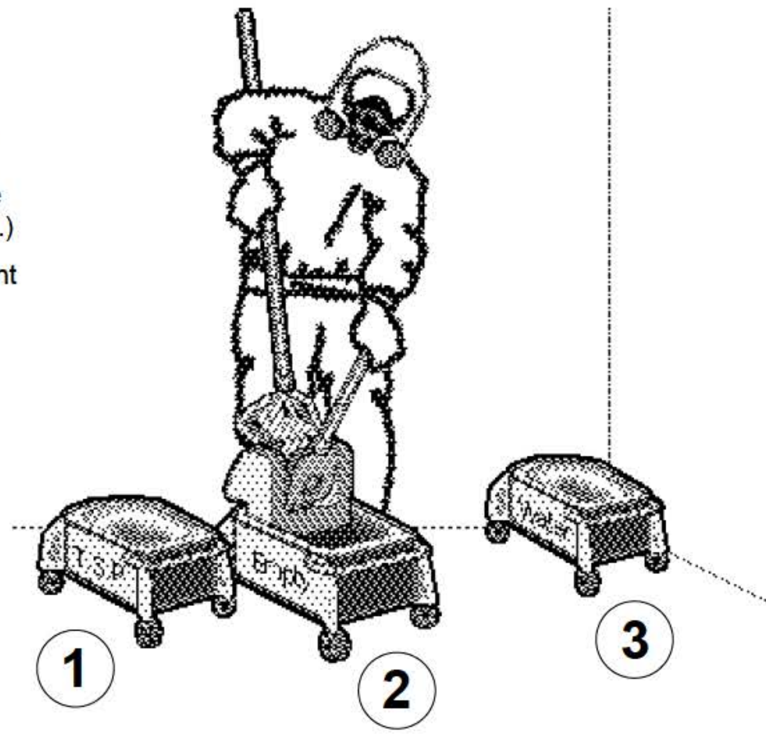
Don't Dry Sweep

Figure 14.4c (continued)

Use the 3-Bucket System.

To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.



Squeeze out the mophead in empty bucket #2. Return to bucket #1 for more detergent solution and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

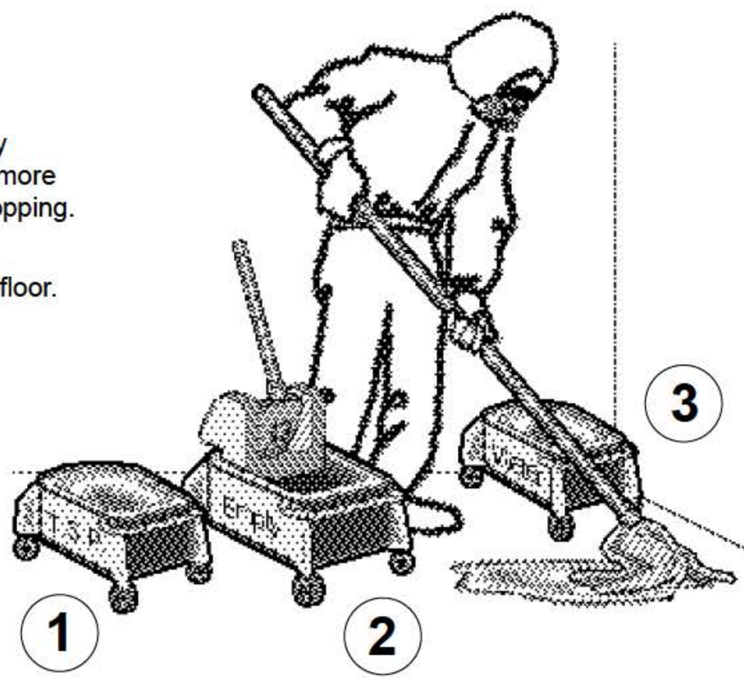


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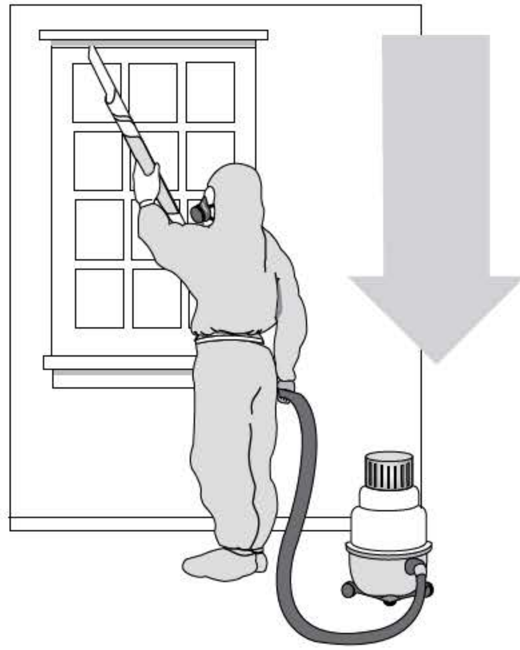
Figure 14.4d (continued)

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

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Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.

Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water *and cleaned.* All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).

Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This

option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dust-retaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table 14.1 Initial Cleaning Wipe-Test Failure Rates for Various Abatement Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)

and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993).

These *Guidelines* do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Cycle Number	Mass Removal Efficiency Percentages			
	Cleaning Method			
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.8	67.0	29.4
5	59.3	88.9	72.1	32.5
6	61.6	91.2	74.4	34.9
7	63.8	93.1	76.4	36.5
8	67.5	95.4	77.5	38.1
9	67.5	97.7	78.7	40.1
10	67.2	100.0	80.2	41.7
11		102.3	80.2	41.7
12		104.6	84.1	44.8
13		104.6	84.5	46.8
14		103.8	84.5	48.4
15				49.6
16				50.8
17				52.4
18				53.6
19				54.4
20				55.2

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) *Effectiveness of Clean-up Techniques for Leaded Paint Dust*

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APPENDIX F

MOLD GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

TG 277

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Readiness thru Health

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

Concern about indoor exposure to mold has been increasing as the public becomes more aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions.

This document provides the best and most current guidance for remediation of clean water damage (<48 hours) and mold contamination (>48 hours) into one resourceful Army guide. This guide has been designed to provide information to facilities management individuals who have little or no experience with mold remediation. It will assist them in making a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to develop or evaluate an in-house remediation plan or evaluate a remediation plan submitted by an outside contractor. If an outside contractor is employed, they must have experience cleaning up mold. Check their references, and have them follow the recommendations presented in this document, EPA guidelines, and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). A multi-disciplinary team approach to mold concerns is best. A health and safety professional, such as an industrial hygienist, should be consulted prior to any remediation activities to assist in the project.

Molds produce tiny spores to reproduce. Mold spores float through the indoor and outdoor air continually. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or uncorrected. There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.(1)

In all situations, the underlying cause of water accumulation must be rectified or mold growth will recur. Any initial water infiltration should be stopped and clean up began immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth. (Refer to Appendix A for detailed guidance on clean water damage response). If the source of water is elevated humidity, actions to maintain the relative humidity levels below 60% to inhibit mold growth should be taken (2). Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilating, and air-conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide adequate drainage and slope the ground away from the foundation.

REMEDIATION PLANNING

- Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Select cleanup methods for moldy items (Appendix B)
- Select Personal Protection Equipment (PPE)- protect remediators (Appendix B)
- Select containment equipment - protect building occupants (Appendix B)
- Select remediation personnel who have the experience and training needed to implement the remediation plan and use PPE and containment as appropriate

REMEDIATE MOISTURE AND MOLD PROBLEMS

- Fix moisture problem, implement repair plan and/or maintenance plan
- Dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Clean and dry moldy materials (Appendix B)
- Discard moldy porous items that can't be cleaned (Appendix B)

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REMEDIATION PROCEDURES

Four levels of abatement are described below. The size of the area impacted by mold contamination primarily determines the type of remediation. The sizing levels below are based on professional judgment and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of mold and preventing dust contaminated with mold from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement. The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. (3)

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be discarded if possible. All materials to be reused should be dry and visibly free from mold. Routine inspections should be conducted to confirm the effectiveness of remediation work. (1 and 3)

The use of bleach or other biocides is questionable in most cases (8). The effectiveness of bleach in reducing living mold is dependent on concentration, residual chlorine levels, and contact time on the surface (8). All of these factors are difficult to control during remediation. Removal of all mold growth can generally be accomplished by physical removal of materials supporting active growth and thorough cleaning of non-porous materials (4). Therefore, application of a biocide serves no purpose that could not be accomplished with a detergent or cleaning agent (4).

The use of gaseous ozone or chlorine dioxide for remedial purposes is **not** recommended. Both compounds are highly toxic and contamination of occupied space may pose a health threat. Furthermore, the effectiveness of these treatments is unproven. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."(4)

FOUR REMEDIATION LEVELS

[Adapted from NYCDOH Guidelines on Assessment and Remediation of Fungi in Indoor Environments (3) and EPA (1)]

Level I: Small Isolated Areas – Total surface area affected less than 10 square feet - e.g., ceiling tiles, small areas on walls. Refer to Appendix B for detailed guidance.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas used by remediation workers for egress should be cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Level II: Medium – Total Surface Area affected between 10 and 100 square feet - e.g., several wallboard panels. (See Appendix B for detailed guidance).

The following procedures *at a minimum* are recommended:

Refer to Appendix C for proper PPE selection. Limited or Full protection may be required depending on the situation.

Refer to Appendix D for Containment procedures.

The work area and areas directly adjacent should be covered with a single layer of 6 mil fire-retardant polyethylene sheet(s) and taped before remediation, to contain dust/debris.

Seal ventilation ducts/grills in the work area and areas directly adjacent with 6 mil polyethylene sheeting. Use an exhaust fan with a High Efficiency Particulate Air (HEPA) filter to generate negative pressurization.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and surrounding areas should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level III be followed.

Level III: Large Area – Total Surface Area affected greater than 100 square feet or potential for increased occupant or remediator exposure during remediation is estimated to be significant. (See Appendix B for detailed guidance).

The following procedures are recommended:

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from occupied spaces using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft^2) follow Level I guidance for PPE and containment and for a areas (>10 ft^2) follow Medium (Level II) or when greater than 100 ft^2 follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended (7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and removed in double-bagged 6-mil plastic. When a decontamination room is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

All areas should be left dry and visibly free from contamination and debris.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air (4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If remediation sampling is necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HAZARD COMMUNICATION

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.

3. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water Damage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£	
Water-Damaged Material†	**Actions**
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours§	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans.
Ceiling tiles	• Discard and replace.
Cellulose insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	• Discard and replace.

Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling should be pried away from wall for drying

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£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.
These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

† If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

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APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft²)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

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Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

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APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*[1] will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination[2].

Safety Tips While Investigating and Evaluating Mold and Moisture Problems[3]

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate[1].

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems[3].

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination[2].

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air[4]. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control[4]."

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program. For further mold assistance, contact USACHPPM, Industrial Hygiene Field Services Program, DSN 584-3118 or (410) 436-3118.

References

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2. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

3. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

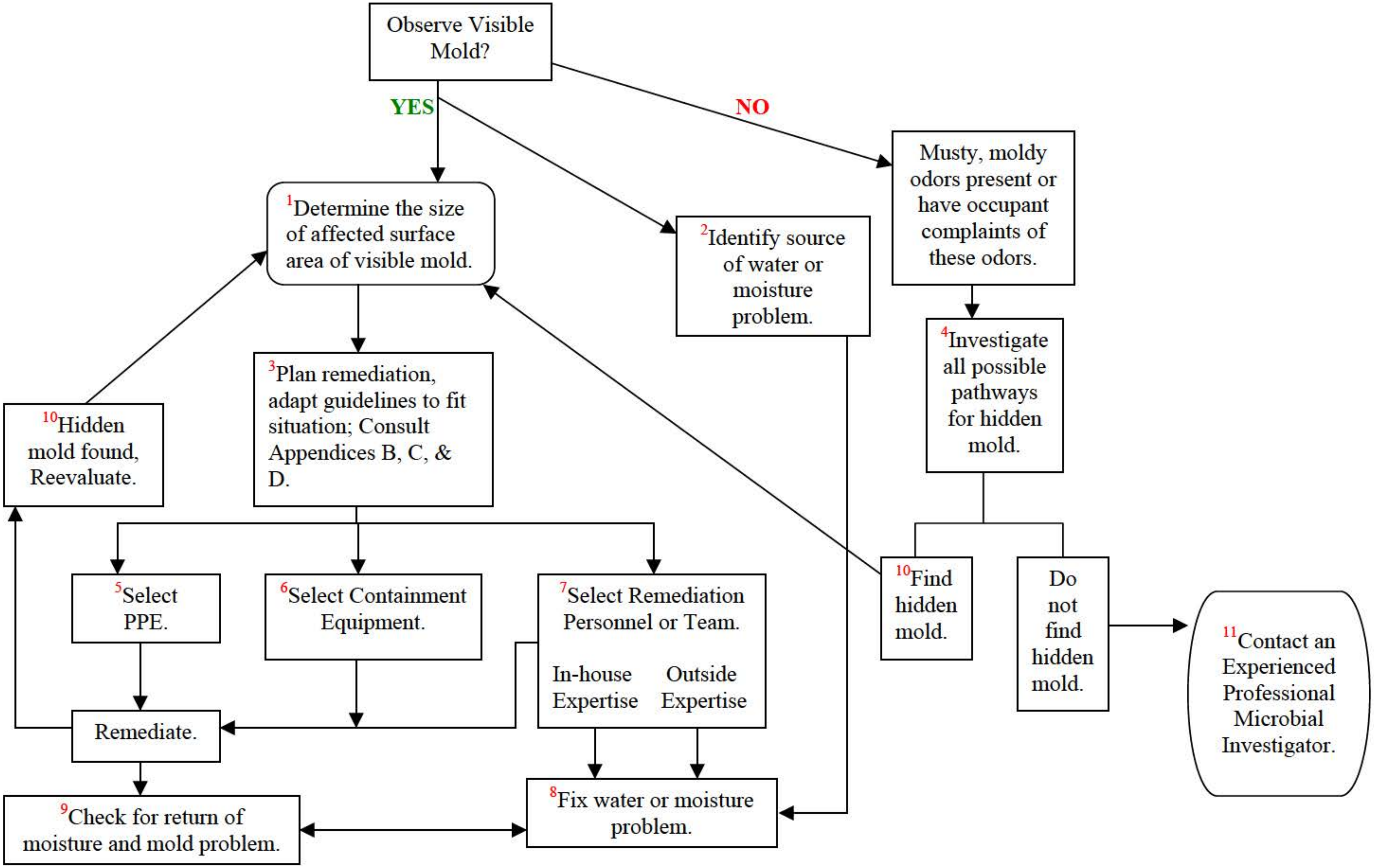
7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134*. 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

MOLD INVESTIGATION DECISION LOGIC



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MOLD INVESTIGATION DECISION LOGIC NOTES:

1. Roughly approximate the total surface area of visible mold. Categorization of the remediation levels are sometimes borderline, so when trying to decide the category to apply, consider the extent of visible growth, such as a heavy blanket of growth on the surface, to barely visible. If heavy growth is apparent, consider moving up to the next level of protection.

2. Do not skip this step. Address the source of water or moisture problem or the mold will simply reappear.

3. Always protect the health and safety of the building occupants and remediators.

4. Mold may be hiding on the backside of drywall, vinyl wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads. Check walls behind furniture, pipe chases and utility tunnels, porous thermal or acoustic liners inside ductwork, or check the rafters (due to roof leaks or insufficient insulation)[3].

5. Utilize appendices B and C for remediation guidance. Use your best judgment during investigations, if not disturbing the mold you may need minimal to no PPE. Do not alarm building occupants unnecessarily, but protect yourself as necessary.

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities[3]. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

®TYVEK, DuPont de Nemours, E.I., & Co., Wilmington, DE.

APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene Survey Report

National Guard Facility
Cascade City Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Cascade Readiness Center** **13817 Ritchie Road** **Cascade, MD 21719**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**June 21, 2013**
Report Date:	**July 31, 2013**

Non-Responsive [redacted]

Manager, Industrial Hygiene Services

Table of Contents

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on June 21, 2013, at the Cascade Readiness Center located at 13817 Ritchie Road, Cascade, MD 21719. The survey was performed by Mr. [redacted]

1. Lead surface and air samples were collected. Sample results were below recommended guidelines and/or regulator standards. See Section 3.0 for detailed sampling results.

2. Lighting levels did not meet the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in two locations measured. See Section 4.0 for detailed findings.

3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.

    a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in two areas sampled.

    b. The relative humidity levels did not meet the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in any occupied areas sampled.

    c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 ppm.

    d. Carbon dioxide (CO_2) levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings.

    See Section 5.0 for detailed sampling results.

4. Drill Hall doors were propped open during the survey. See Section 5.0 for detailed findings.

5. No suspect asbestos containing materials (ACM) were observed. See Section 6.0 for detailed sampling results.

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Section 2.0 Operation Description & Observations

The Cascade Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, and a converted firing range area (currently the Parachute Packing Room). There were approximately 5 full-time employees stationed at this facility at the time of this survey. There is no maintenance personnel assigned to the building.

The 18,400 square foot building is reported to have been built in 1994. It is a single story structure. The exterior is brick and block. The interior walls are block and drywall. The floors are concrete, 12"x12" floor tiles, and carpet.

The heating system is a switchable (oil/gas) forced hot water unit. There appears to be two air conditioning (A/C) systems employed: three roof-top units and room unit ventilators.

There is no child-care facility in the building.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared to be properly designed. Personnel had supportive chairs.

This facility has a converted firing range (CFR) that is now used as the Parachute Packing Room. There was no access to the room at the time of this survey.

No suspect asbestos containing material (ACM) was observed.

No chipped or peeling paint were observed.

Housekeeping is adequate.

It was reported that the building has a history of roof leaks.

Several water-stained ceiling tiles were observed in four areas: Kitchen Corridor, Administration Corridor, Drill Hall Entranceway, and the Dining Room (fungal growth was observed on these tiles).

Several areas of chipped floor tiles were observed in the Kitchen Corridor.

During this survey, the Drill Hall doors were propped open allowing warm, moist air to enter the building.

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Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 um mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2
1	Drill Hall	<6.8	*
2	Orderly Room	<6.7	*
3	Blank	<3 ug	*
4	Blank	*	<12 ug
5	Drill Hall Floor Center	*	<110
6	Drill Hall Cabinet Top	*	<110
7	Drill Hall Electrical Panel Top	*	<110
8	Kitchen Microwave Top	*	<110
9	Kitchen Floor	*	<110
10	Dining Area Window Sill	*	<110
11	Storage 106 Cabinet Top	*	<110
12	Lobby Floor	*	<110
13	Office 113 Window Sill	*	<110
14	Office 111 Window Sill	*	<110
15	Office 108 Cabinet Top	*	<110
16	Office 141 Window Sill	*	<110
-	**Criteria**	**50**	**200**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2 =** micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Sources:

1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges
2. OSHA 29CFR1910.1025 Lead Standard

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in

NG PAM 420-15 “Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges” as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Lead surface and air samples were collected. The following is a summary of the sample results from this survey.

- Surface levels for lead were less than the recommended guideline of 200 ug/ft^2 in all locations sampled.

- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m^3).

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Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98082EL). The light meter was last calibrated in April 2013. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Drill Hall	30.8	10	Yes
Bulk Storage 106	21.3	10	Yes
Supply Room	**22.2**	**30**	**No**
Office 113	92.5	30-50	Yes
Office 111	130.1	30-50	Yes
Office 112	78.9	30-50	Yes
Office 115	82.1	30-50	Yes
Administrative Corridor	19.8	5	Yes
Classroom 108	64.8	30-50	Yes
Lobby	32.1	10	Yes
Kitchen Corridor	24.7	5	Yes
Mechanical Room	46.1	30	Yes
Latrine	42.2	5	Yes
CFR Corridor	27.5	5	Yes
Kitchen (prep)	148.4	50	Yes
Dining Room/Classroom	30.3	30-50	Yes
Men’s Latrine 123	48.2	5	Yes
Women’s Latrine	49.7	5	Yes
Gym	39.1	30	Yes
Office 118	**16.5**	**30-50**	**No**
Office 139	49.8	30-50	Yes
Office 141	53.7	30-50	Yes
Office 105	69.3	30-50	Yes

Table Notes:
1. FC = Foot Candles
2. **Bolded** results did not meet listed criteria

Source: ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

The lighting levels did not meet the minimum recommended guideline in Office 118 and the Supply Room.

Section 5.0 Indoor Air Quality

Survey measurements were made for comfort parameters and ventilation (temperature, relative humidity, carbon dioxide, and carbon monoxide). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7575-X (Serial #1228008). The IAQ Meter was last calibrated in July 2012.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2010). ASHRAE specifies temperature ranges for human comfort (ASHRAE 55-2010). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60%.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	73.2	48.4	342	0.0
Office 111	72.8	53.5	448	0.0
Criteria	**68-79**	**30-60**	**<1,042**	**<9**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **°F =** degrees Fahrenheit

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements met the recommended 68-79°F in all sampled areas.

- Relative humidity levels met the recommended guideline of 30 – 60 % in all sampled areas.

- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level. For this survey, carbon dioxide levels did not exceed the recommended ceiling of

1,042 ppm (700 ppm + 342 ppm). This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide

- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. The following observation were noted:

  1. Structural damage to walls in Office 111 was observed. This type of damage can be the source of water intrusion and elevated humidity.

  2. Water-stained ceiling tiles were observed in the Kitchen Corridor, Administration Corridor, Drill Hall Entrance, and Dining Room. Visible growth was observed on the water-stained tiles in the Dining Room.

  3. Drill Hall doors were propped open during the site survey allowing warm, moist air to infiltrate the facility. This practice allows warm moist air and potentially degraded air (mower exhaust, dust, etc.) to enter the building.

  4. It was reported that the roof leaks in several places.

  5. Several floor tiles in the Kitchen Corridor are cracked and loose. These should be repaired.

Section 6.0 Suspect Asbestos Containing Building Materials (ACM)

No suspect (ACM) (asbestos containing material) was noted at the time of this survey:

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98002EL	4/2013	NA
SKC Air Sampling Pump	647631	6/21/13	2.46 LPM
SKC Air Sampling Pump	767926	6/21/13	2.47 LPM

Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

Appendix A. Laboratory Analysis Report

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org
LAB #100470

Client:	National Guard Bureau	**Job Name:**	ARNG 4a MD	**Chain Of Custody:**	516189
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Cascade	**Date Submitted:**	6/25/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	7/2/2013 **Report Date:** 7/2/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
13073125	1	Flame	Air	443	N/A	6.8	ug/m³	<3	<6.8	ug/m³	
13073126	2	Flame	Air	445	N/A	6.7	ug/m³	<3	<6.7	ug/m³	
13073127	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13073128	4	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13073129	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073130	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073131	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073132	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073133	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073134	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073135	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073136	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073137	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073138	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073139	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073140	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org
LAB #100470

Client:	National Guard Bureau	**Job Name:**	ARNG 4a MD	**Chain Of Custody:**	516189		
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Cascade	**Date Submitted:**	6/25/2013		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	7/2/2013	**Report Date:**	7/2/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)
%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: Nida McGarvey

Technical Manager: G Edward Carney

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AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 516189

1 of 2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: ARNG 4a MD
2. Job Location: CASCADE
3. Job #: [redacted] P.O. #: W912K6-09-A-0003
4. Contact Perso[redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day + 7/2/13 Date Due: ☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)	☒ Include COC/Field Data Sheets with Report ☒ Email: dlarson @compliance place.com ☐ Fax: shirley.chapman1@us.army.mil ☐ Verbals: ken.forsythe@us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400____(QTY)
☐ Fiberglass____(QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA____(QTY)
☐ NIOSH 7402____(QTY)
☐ Other (specify____)____(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate____(QTY)
☐ EPA Point Count____(QTY)
☐ NY State Friable 198.1____(QTY)
☐ Grav. Reduction ELAP 198.6____(QTY)
☐ Other (specify____)____(QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield____(QTY)
☐ NY State PLM/TEM____(QTY)
☐ Residual Ash____(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust____(QTY)
☐ Quan. (s/area) Vacuum D5755-95____(QTY)
☐ Quan. (s/area)Dust D6480-99____(QTY)
TEM Water
☐ Qual. (pres/abs)____(QTY)
☐ ELAP 198.2/EPA 100.2____(QTY)
☐ EPA 100.1____(QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples____°C)

Metals Analysis
☐ Pb Paint Chip____(QTY)
☐ Pb Dust Wipe (wipe type Ghost) 13 (QTY)
☐ Pb Air 3 (QTY)
☐ Pb Soil/Solid____(QTY)
☐ Pb TCLP____(QTY)
☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Pb Furnace (Media____)____(QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:____
Collection Media____
☐ Spore-Trap____(QTY) ☐ Surface Vacuum Dust____(QTY)
☐ Surface Swab____(QTY) ☐ Culturable ID Genus (Media____)____(QTY)
☐ Surface Tape____(QTY) ☐ Culturable ID Species (Media____)____(QTY)
☐ Other (Specify____)____(QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1 DRILL HALL		6/21/13	443					✓		✓						
2 ORDERLY RM			445					✓		✓						
3 BLANK			—					✓		✓						
4 BLANK				—				✓				✓				
5 DRILL HALL	FLOOR CENTER			100cm²				✓				✓				
6 DRILL HALL	Cabinet TOP							✓				✓				
7 DRILL HALL	Elect. Panel TOP							✓				✓				
8 KITCHEN	MICROWAVE TOP							✓				✓				
9 KITCHEN	FLOOR							✓				✓				
10 DINING AREA	Window Sill							✓				✓				
11 STOR 106	File CABINET TOP							✓				✓				
12 LOBBY	FLOOR							✓				✓				

LOT 3/23/12
EXP 9/15

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 6/25/13 @ 940 Via: Fedex By (Print): MM Sign:
2. Date/Time Analyzed: __/__/__ @____ By (Print):____ Sign:____
3. Results Reported To:____ Via:____ Date: __/__/__ Time:____ Initials:____
4. Comments:

OW (410) 247-2024 159202 210 REV. 6.08

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Focused on Results www.amalab.com
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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) S16189 2 of 2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: ARNG 4aMD
2. Job Location: CASCADE
3. Job #: PO #: W912K6-09-A-0003
4. Contact Pers Non-Responsive @ phone #: (410) 942-0273
5. Submitted by Non-Responsive gnatur Non-Responsive

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day + Date Due: ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ Include COC/Field Data Sheets with Report ☒ Email: dlarson @compliance place.com ☐ Fax: shirley.chapman1@us.army.mil ☐ Verbals: ken.forsythe@us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area)Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☐ Pb Dust Wipe (wipe type CoHoST) 13 (QTY)
☐ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13	OFFICE 113 WINDOW SILL	6/21/13		100cm²				✓				✓				
14	OFFICE SHUM. WINDOW SILL	↓		↓				✓				✓				
15	OFFICE 108 CABINET TOP	↓		↓				✓				✓				
16	OFFICE 141 WINDOW SILL	↓		↓				✓				✓				

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY:
1. Date/Time RCVD: __/__/__ @ ____ Via: ____ By (Print): ____ Sign:
2. Date/Time Analyzed: __/__/__ @ ____ By (Print): ____ Sign:
3. Results Reported To: ____ Via: ____ Date: __/__/__ Time: ____ Initials:
4. Comments:

Appendix B. Photographs

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Cascade RC

Structural Wall Damage in Office 111

Water Stained Ceiling Tile

Ceiling Tile Visible Fungal Growth

Drill Hall Open Door

Boiler Room

No Access to Converted Firing Range

Damaged Floor Tiles in Corridor

Appendix C. Floor Plan

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EVACUATION PLAN

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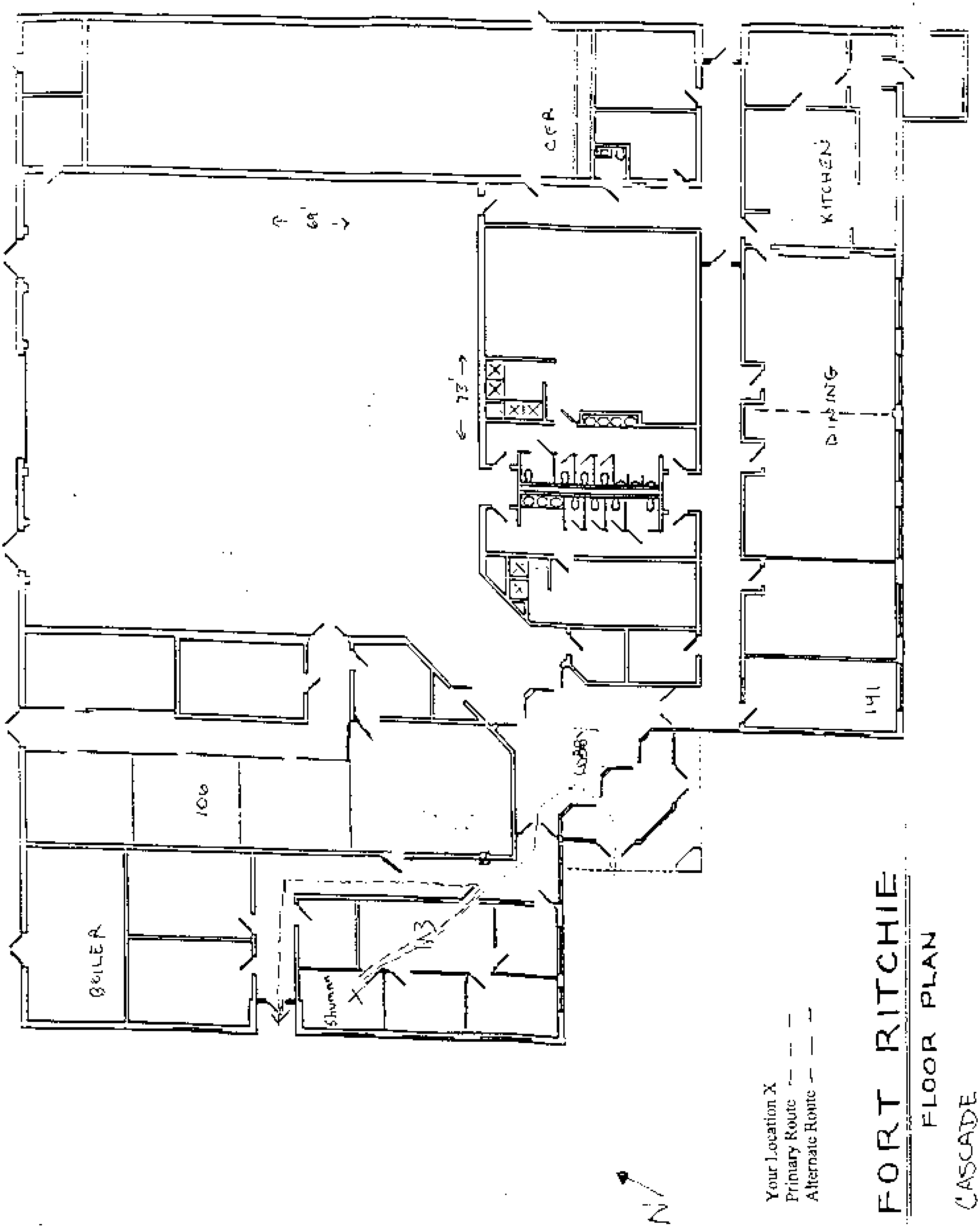

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Appendix D. References

1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead.

2. American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2011 Edition.

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition.

4. American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2010.

5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.

6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.

7. National Emission Standard Hazardous Air Pollutants (NESHAP) – The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

8. National Ambient Air Quality Standards (NAAQS) - National primary ambient air quality standards for carbon monoxide 40 CFR 50.8.

9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227 (h) (3)].

10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM).

11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.

12. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.

13. ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

MAY 11 2007

MEMORANDUM FOR National Guard Bureau Region North Industrial Hygiene Office (NGB-ARS-IHNE/Ms. [redacted]), 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities, Industrial Hygiene Baseline Survey, MG William J. Witte Armory, Catonsville, MD, Report No. 55-ML-01ED-03/07, 24 July 2003

1. Enclosed is the final copy of the subject report and two CD-ROMs.

2. Our point of contact is Ms. [redacted], at commercial (410) 436-5475/3118, DSN 584-5475/3118 or electronic mail: [redacted]@us.army.mil

FOR THE COMMANDER:

[redacted]

Encl

Director, Occupational Health Sciences

CF: (wo/CD ROMs)
USACHPPM-NORTH (MCHB-AN-IH/MR. [redacted])

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U.S. Army Center for Health Promotion and Preventive Medicine

MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEY
REPORT NO. 55-ML-01ED-03/07
MG WILLIAM J. WITTE ARMORY
CATONSVILLE, MD
24 JULY 2003

Distribution limited to U.S. Government agencies only. Requests for this document must be referred to the National Guard Bureau Region North Industrial Hygiene Office (NGB-ARS-IHNE/Ms. Vanessa Franchere), 301-IH Old Bay Lane, Havre de Grace, MD 21078
[redacted]

CHPPM FORM 433-E (MCHB-CS-IPD), OCT 03

Readiness Thru Health

DESTRUCTION NOTICE - Destroy by any method that will prevent disclosure of contents or reconstruction of the document.

U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed $3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- ♦ *Integrity is the foundation*
- ♦ *Excellence is the standard*
- ♦ *Customer satisfaction is the focus*
- ♦ *Its people are the most valued resource*
- ♦ *Continuous quality improvement is its pathway*

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

CHPPM FORM 433-E (MCHB-CS-IPD), OCT 03 *(reverse)*

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEY
REPORT NO. 55-ML-01ED-03/07
MG WILLIAM J. WITTE ARMORY
CATONSVILLE, MD
24 JULY 2003

1. PURPOSE. To perform an industrial hygiene survey to identify and measure the existence and extent of potentially hazardous operations or conditions at the Maryland Army National Guard MG William J. Witte Armory, Catonsville, MD. This survey will serve as an update to the baseline so that an occupational exposure history can be compiled for each civilian or military employee.

2. CONCLUSIONS. Significant health and safety concerns were: high levels of lead in dust in several areas; the lack of a site Asbestos Management Plan (AMP); a leaking roof creating safety hazards and supporting mold growth; a non-operational heating, ventilation, and air conditioning system; and the lack of a written Hazard Communication (HAZCOM) Program.

3. RECOMMENDATIONS.

a. Lead Exposure. Health Risk Assessment Codes (RAC) 3 for adults. Health RAC 2 for children.

(1) Develop and implement a written Lead Hazard Management Plan for the Armory. Ensure that the Armory complies with the Occupational Safety and Health Assessment Lead Standard, Title 29 Code of Federal Regulation (CFR) 1910.1025, and the Occupational Safety and Health Administration Lead in Construction Standard, Title 29 CFR 1926.62.

(2) Repair and stabilize deteriorated paint.

(3) Address all potential lead hazards before continuing to extend the use of this facility to children.

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(4) Clean horizontal surfaces in all areas that children may visit to the Environmental Protection Agency and State of MD lead in dust standard for children. Clean horizontal surfaces in the administrative areas to the National Guard Bureau Region North Industrial Hygiene Office and United States Army Center for Health Promotion and Preventive Medicine recommended levels. Clean all areas where sampling results showed elevated levels of lead. At a minimum, if only adults use this facility, clean to the recommended maximum levels for adults. Follow the comprehensive guidelines for cleaning in Appendix E and the decontamination requirements for the former Indoor Firing Range (IFR) provided in National Guard Pamphlet 420-15. Consult with the Maryland Armory Environmental Coordinator concerning disposal requirements after cleanup.

(5) Pending cleanup, restrict access to the former IFR (current storage room and classroom) by keeping it locked. Post a sign warning against entry into the room except in an emergency, and against storing any material. Ensure that personnel wear disposable gloves, disposable coveralls, and booties to prevent tracking lead to other areas of the Armory when cleaning the former IFR.

b. Asbestos Exposure. Health RAC 3. Continue the asbestos abatement in the Armory in accordance with Federal, state, and local regulations. Develop and implement an AMP.

c. Safety Hazards. Safety RAC 4. Continue to repair roof leaks and damaged building materials. Replace loose ceiling tiles.

d. Mold Exposure. Health RAC 4. Repair the Orderly Room roof leak. Remove and replace ceiling tiles contaminated with mold growth after determining whether they contain asbestos. Abate all areas of visible mold. For additional guidance on moisture control and mold remediation refer to Appendix F.

e. Heating, Ventilation, and Air Conditioning Systems. No RAC can be assigned. Repair heating system problems. Purchase and install more air conditioning units.

f. Occupational Safety and Health Programs. Health RAC 3. Develop and implement a written HAZCOM Program for the facility. Maintain HAZCOM documentation and file it in an accessible area.

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MDARNG Facilities, Industrial Hygiene Baseline Survey, MG William Witte Armory, Catonsville, MD, Report No. 55-ML-01ED-03/07, 24 July 2003

CONTENTS

MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEY
REPORT NO. 55-ML-01ED-03/07
MG WILLIAM J. WITTE ARMORY
CATONSVILLE MD
24 JULY 2003

1. REFERENCES. See Appendix A.

2. PURPOSE. To identify and measure the existence and extent of potentially hazardous operations or conditions at the Maryland Army National Guard MG William J. Witte Armory, Catonsville, MD. This survey will serve as an update to the baseline so that an occupational exposure history can be compiled for each civilian or military employee.

3. AUTHORITY. Fax, National Guard Bureau (NGB) Region North, Industrial Hygiene Office, (NGB-ARS-IHNE/Ms. [redacted]), 28 February 2003.

4. GENERAL.

a. Personnel Contacted. Staff Sergeant (SSG) [redacted], Manager, (410) 788-7080. SSG [redacted], Environmental Compliance Assessment Coordinator for the MD Environmental Office, provided additional information.

b. Survey Personnel. This survey was conducted on 23 July 2003 by Ms. [redacted], Industrial Hygienist, United States Army Center for Health Promotion and Preventive Medicine (USACHPPM).

c. Risk Assessment Codes (RACs). The Department of Defense Instruction (DODI) 6055.1 provides a method for assigning RACs to health hazards that are based on the magnitude of exposures to physical, chemical, and biological agents and the possible medical effects. The DODI 6055.1 also provides RACs for safety and ergonomic hazards. A RAC is an expression of the risk associated with a hazard that combines the hazard severity and accident probability into a single numeral. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

d. Background. The MG William J. Witte Armory was located at 130 Mellor Avenue, Catonsville, MD 21228-5142. The Armory was built in 1940 and rehabilitated at a later date. Its mission was administration. It was being offered for rental, so could host activities that include children. No floor plan could be located for this report.

Use of trademarked names does not imply endorsement by the U.S. Army but is intended only to assist in identification of a specific product.

MDARNG Facilities, Industrial Hygiene Baseline Survey, MG William Witte Armory, Catonsville, MD, Report No. 55-ML-01ED-03/07, 24 July 2003

5. METHODOLOGY.

a. Assessment Criteria. Army Regulation 40-5 contains the requirement that airborne chemical exposures in Army facilities must comply with the lower of the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit or the American Conference of Governmental Industrial Hygienists Threshold Limit Value®. The NGB Region North Industrial Hygiene Office criterion for lead in surface dust is discussed in Appendix B.

b. Calibration. All instruments were calibrated in accordance with manufacturers' instructions using National Institute of Standards and Testing traceable method.

c. Methodology. The survey consisted of the collection of indoor air quality and ventilation measurements, sampling surface dust and air for lead, observation of work practices and procedures, and employee interviews.

6. FINDINGS AND DISCUSSION.

a. Description of Operations. The Armory had a drill hall, classroom spaces, weapons vaults, and offices. There were no industrial operations.

b. Occupational Safety and Health Programs. No written Hazard Communication (HAZCOM) Program was found. The OSHA requires employers to provide information to their employees concerning hazardous chemicals to which they are exposed. This is accomplished by establishing a HAZCOM Program for Armory employees. Program elements include the use of labels and other forms of warning, Material Safety Data Sheets and information and training addressing protective measures for employees.

c. Building Condition.

(1) Safety Hazards. The roof was leaking, damaging ceiling tiles in the Orderly Room. There was a potential hazard of tiles falling and of slips and falls on wet floor surfaces. As discussed below, there were several areas with deteriorating paint.

(2) Indoor Firing Range (IFR). The former IFR was being used as a storage room and a classroom. There were no records of cleaning or lead abatement ever having occurred in the IFR.

d. Indoor Environmental Quality.

(1) Heating, Ventilation, and Air Conditioning Systems. The building was heated with steam. The heat was reportedly working on only one side of the building. Cooling was provided

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by several window-type air conditioners mounted in regularly used offices, and by the manual operation of windows. The Armory management had requested more air conditioning units.

(2) Temperature, Humidity Control, and Air Exchange Rate. Measurements could not be located for this report.

(3) Mold and Moisture Problems. The Orderly Room roof leak had caused mold growth on a portion of the ceiling. Water may have damaged the insulation and may have resulted in further mold growth. Mold exposure may cause illness in Armory employees.

e. Water Quality. There were no concerns expressed by Armory personnel about water quality. No samples were collected.

f. Lead Hazards. The age of the building indicated that the presence of lead-based paint was likely. Some rooms in the Armory had extensive areas of deteriorated paint. SSG McCuen stated that there were no records of any lead abatement ever having occurred in this facility. No Lead Hazard Management Plan (LHMP) was found.

(1) Criteria for lead in dust. The Environmental Protection Agency (EPA) and State of MD limits for lead in dust are 40 micrograms per square foot ($\mu g/ft^2$) on floors, 250 $\mu g/ft^2$ on windowsills, and 400 $\mu g/ft^2$ in window troughs. These limits apply to pre-1978 Army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The NGB Region North Industrial Hygiene Office concurs with the USACHPPM recommended maximum level of 200 $\mu g/ft^2$ on floors and frequently contacted surfaces, which is more stringent for windowsills than the EPA and State of MD standards. This level was adopted from OSHA Compliance Letter 02-02-58. Further information is provided in Appendix D.

(2) Results for lead in dust. Sampling locations are shown in Appendix C. Laboratory reports are in Appendix B. Samples were collected in 10 locations. Results are shown in the Table. Results exceeding any of the criteria are highlighted. The results confirm that the former IFR was never adequately decontaminated. The high levels in the arms vaults could have been produced either by tracking from the former IFR or weapons cleaning. There was a risk of tracking lead to other areas of the Armory.

MDARNG Facilities, Industrial Hygiene Baseline Survey, MG William Witte Armory, Catonsville, MD, Report No. 55-ML-01ED-03/07, 24 July 2003

TABLE Lead Levels in Dust.

Wipe Sample #	Location of Samples	Result, µg/ft²
CAW01	Vault 119, munitions area on floor	350
CAW02	Kitchen 106, floor near stove	<23
CAW03	Room B-2 (Basement) (SFC [redacted] on window sill	<23
CAW04	Room B-3 (Basement), floor at corner	<23
CAW05	Former IFR, floor at bullet trap location	9,200
CAW06	Former IFR, floor behind firing line	240
CAW07	Corridor, floor one foot from door to former IFR	59
CAW08	Room 122, window sill	41
CAW09	Vault 120, arms area	150
CAW10	Room 112 (Recruiter's Office) wall near door to other offices	<23

g. Asbestos. SSG [redacted] stated that asbestos abatement was ongoing and was nearly complete at the time of the site visit. A site Asbestos Management Plan (AMP) was not found. If there were still asbestos in the facility and damage occurred in the future, the asbestos could become friable and asbestos fibers could be released. Army policy requires the Armory to establish and execute an AMP for all asbestos in the facility, and to take immediate corrective action where a possible asbestos hazard has been identified.

h. Noise Hazards. No operations with the potential to generate hazardous noise levels were identified.

7. CONCLUSIONS. Significant health and safety concerns were: high levels of lead in dust in several areas; the lack of a site AMP; a leaking roof creating safety hazards and supporting mold growth; a nonoperational Heating Ventilating and Air Conditioning system; and the lack of a written HAZCOM Program.

8. RECOMMENDATIONS.

a. Lead Exposure. Health RAC 3 for adults. Health RAC 2 for children.

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(1) Develop and implement a written LHMP for the Armory. Ensure that the Armory complies with the OSHA Lead Standard, Title 29 Code of Federal Regulations (CFR) 1910.1025, and the OSHA Lead in Construction Standard, Title 29 CFR 1926.62.

(2) Repair and stabilize deteriorated paint.

(3) Address all potential lead hazards before continuing to extend the use of this facility to children.

(4) Clean horizontal surfaces in all areas that children may visit to the EPA and State of MD lead in dust standard for children. Clean horizontal surfaces in the administrative areas to the NGB Region North Industrial Hygiene Office and USACHPPM recommended levels. Clean all areas where sampling results showed elevated levels of lead. At a minimum, if only adults use this facility, clean to the recommended maximum levels for adults. Follow the comprehensive guidelines for cleaning in Appendix E and the decontamination requirements for the former IFR provided in National Guard Pamphlet 420-15. Consult with the Maryland Armory Environmental Coordinator concerning disposal requirements after cleanup.

(5) Pending cleanup, restrict access to the former IFR (current storage room and classroom) by keeping it locked. Post a sign warning against entry into the room except in an emergency, and against storing any material. Ensure that personnel wear disposable gloves, disposable coveralls, and booties to prevent tracking lead to other areas of the Armory when cleaning the former IFR.

b. Asbestos Exposure. Health RAC 3. Continue the asbestos abatement in the Armory in accordance with Federal, state, and local regulations. Develop and implement an AMP.

c. Safety Hazards. Safety RAC 4. Continue to repair roof leaks and damaged building materials. Replace loose ceiling tiles.

d. Mold Exposure. Health RAC 4. Repair the Orderly Room roof leak. Remove and replace ceiling tiles contaminated with mold growth, after determining whether they contain asbestos. Abate all areas of visible mold. For additional guidance on moisture control and mold remediation refer to Appendix F.

e. Heating, Ventilation, and Air Conditioning Systems. No RAC can be assigned. Repair heating system problems. Purchase and install more air conditioning units.

f. Occupational Safety and Health Programs. Health RAC 3. Develop and implement a written HAZCOM Program for the facility. Maintain HAZCOM documentation and file it in an accessible area.

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9. ADDITIONAL ASSISTANCE. For additional assistance or questions concerning this report, please contact the undersigned at commercial (410) 436-3118/5475, DSN 584-5475/3118 or electronic mail [redacted]t@us.army.mil

[redacted]
Industrial Hygienist
Industrial Hygiene Field Services Program

APPROVED:

[redacted]
MAJ, MS
Program Manager
Industrial Hygiene Field Services Program

APPENDIX A

REFERENCES

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11. Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program, 19 August 1998. http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf

APPENDIX B

LABORATORY REPORT

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD BY WIPE SAMPLING

RES Job Number:	**RES 96062-1**
Client:	**Army National Guard IH - West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**None Given**
Date Samples Received:	**August 7, 2003**
Analysis Type:	**USEPA SW846 3050B / AA(7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 4, 2003**

Client ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
CA Blank 01	EM 800617	0.11	BDL	23	BDL
CA W01	EM 800618	0.11	38.0	23	345
CA W02	EM 800619	0.11	BDL	23	BDL
CA W03	EM 800620	0.11	BDL	23	BDL
CA W04	EM 800621	0.11	BDL	23	BDL
CA W05	EM 800622	0.11	1011.0	23	9191
CA Blank 02	EM 800623	0.11	BDL	23	BDL
CA W06	EM 800624	0.11	26.4	23	240
CA W07	EM 800625	0.11	6.5	23	59
CA W08	EM 800626	0.11	4.5	23	41
CA W09	EM 800627	0.11	16.1	23	146
CA W10	EM 800629	0.11	BDL	23	BDL
CA Blank 03	EM 800630	0.11	BDL	23	BDL

***Calculations Based On A 1 sq.ft. Sample Area Unless Otherwise Noted**

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APPENDIX C
PHOTOGRAPHS

TABLE D-1. Photographs.

Photo No.	Location
1	Vault 119, floor in munitions area (Wipe sample)
2	Kitchen 1206, floor near stove (Wipe sample)
3	Kitchen Storage Area (Deteriorated paint)
4	Room B-2 (Basement) (SFC [redacted]), window sill (Wipe sample)
5	Room B-2, baseboard (Deteriorated paint)
6	Room B-3 (Basement), floor in corner (Wipe sample and deteriorated paint)
7	Former IFR, floor at bullet trap location (Wipe sample)
8	Former IFR wall (Deteriorated paint)
9	Former IFR, floor near firing line (Wipe sample)
10	Corridor, floor one foot outside former IFR (Wipe sample)
11	Room 122, window sill (Wipe sample)
12	Vault 120, arms area (Wipe sample)
13	Room 112 (Recruiter's Office), wall near door to other offices (Wipe sample)
14	Room 112 wall (Deteriorated paint)
15	Room 110, ceiling near light fixture (Deteriorated paint)

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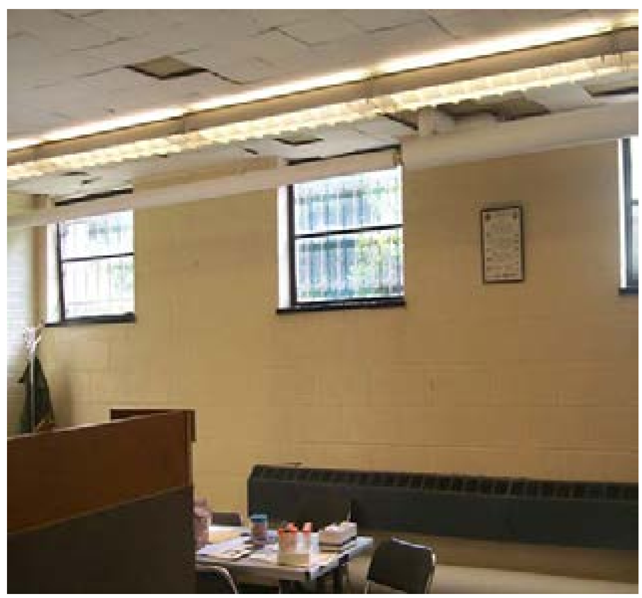
Photograph 1

Photograph 2

Photograph 3



Photograph 4

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Photograph 5

Photograph 6

Photograph 7

Photograph 8

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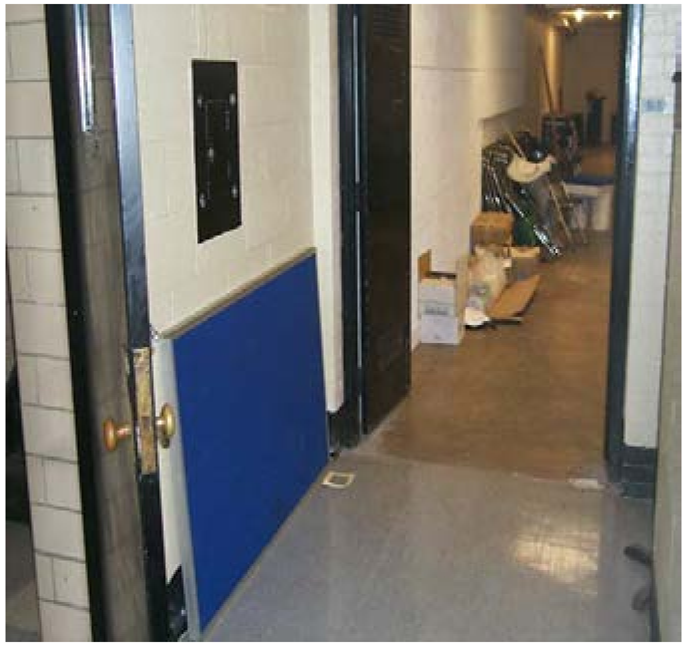
Photograph 9



Photograph 10

Photograph 11

Photograph 12

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Photograph 13

Photograph 14

Photograph 15

C-5

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APPENDIX D

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE

ASSESSMENT CRITERIA FOR LEAD

Subject: Recommendations for Surface Lead Dust in Armories

1. In armories that do not contain childcare facilities, the National Guard Bureau (NGB) Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 micrograms per square foot ($\mu g/ft^2$). If a special function will be held in which children will be present in this facility, consider thoroughly cleaning the areas that will be accessible to children prior to the function. This guidance is based on professional judgment, risk assessments, adaptation of Occupational Safety and Health Administration (OSHA) guidance, and feasibility of cleaning to a certain level.

a. Environmental Protection Agency (EPA) standards (40 Code of Federal Regulations (CFR) 745.227(h)(3)) are not directly applicable because they are criteria for dust-lead hazards developed for floors (40 $\mu g/ft^2$) and windowsills (250 $\mu g/ft^2$) in residential dwellings and child occupied facilities. A child occupied facility is defined as a building, or portion of a building, constructed prior to 1978, visited regularly by the same child, 6 years of age or under, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hours and the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60 hours. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. The OSHA has no specific requirement for work area surfaces. The lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead dust. In workplaces where lead dust is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. The OSHA used to cite a level of 200 $\mu g/ft^2$ in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 $\mu g/ft^2$ is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels above these recommendations do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All states will receive this guidance when it is completed. In the interim, we recommend the following actions:

a. Clean all areas that will be accessible to children to the EPA dust-lead standard for children 6 years of age or under (40 $\mu g/ft^2$ on floors and 250 $\mu g/ft^2$ on windowsills).

b. Refer to the local authorities' regulations since they can be more stringent than Federal regulations.

c. Post signs in the area to inform people of the presence of lead dust and its effects.

d. If Soldiers clean weapons in the facility, change the policy so that they cannot clean their weapons in the facility, or if they are allowed to clean their weapons indoors, they must clean the area by wet wiping and mopping the area when they are done.

e. If the paint is peeling, contact the state Environmental Office to test for lead content and provide recommendations.

3. Air samples collected on individuals in the Armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m^3 averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead dust in this building.

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APPENDIX E

LEAD CLEANING GUIDANCE

HUD TECHNICAL GUIDELINES FOR THE EVALUATION AND CONTROL OF LEAD-BASED PAINT HAZARDS IN HOUSING 1998

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CHAPTER 14: CLEANING

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Step-by-Step Summary

Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
3. Have sufficient cleaning equipment and supplies *before* beginning work.
4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
13. Paint or otherwise seal treated surfaces and interior floors.
14. Conduct a clearance examination (see Chapter 15).
15. If clearance is not achieved, repeat the final cleaning.

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16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.

17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.

18. Cleaning equipment list:

    - HEPA vacuums.
    - Detergent.
    - Waterproof gloves.
    - Rags.
    - Sponges.
    - Mops.
    - Buckets.
    - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
    - 6-mil plastic bags.
    - Debris containers.
    - Waste water containers.
    - Shovels.
    - Rakes.
    - Water-misting sprayers.
    - 6-mil polyethylene sheeting (or equivalent).

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Chapter 14: Cleaning

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris *and* dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?
- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

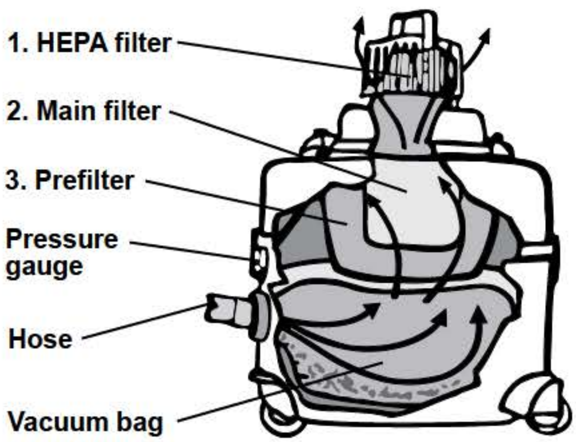
To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards *and* were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and pre-filter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the pre-filter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

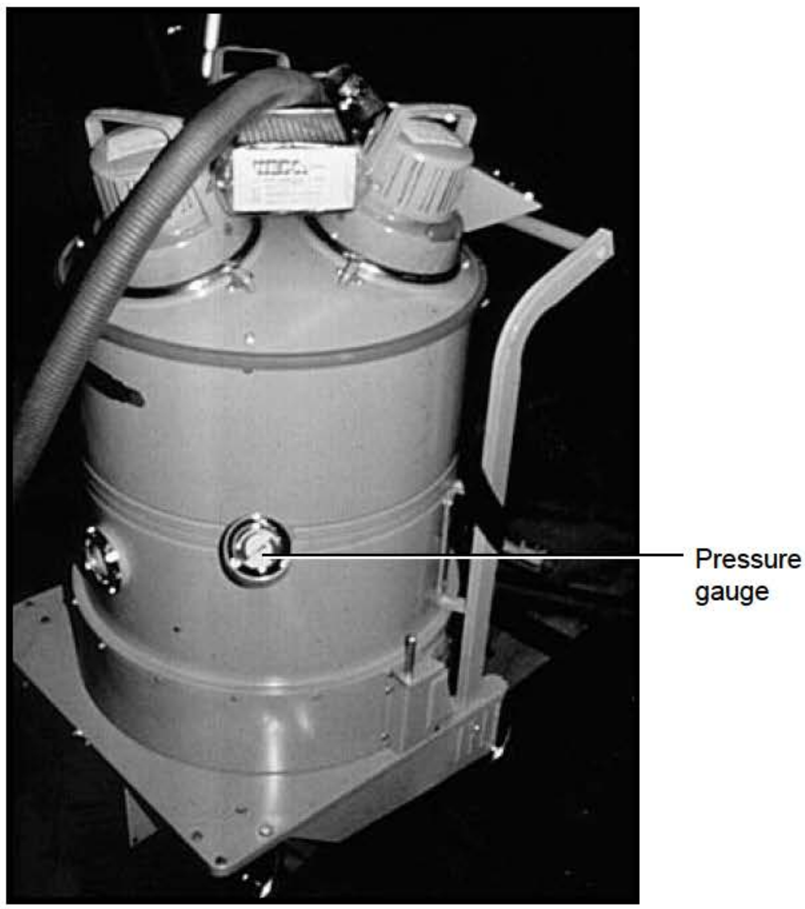
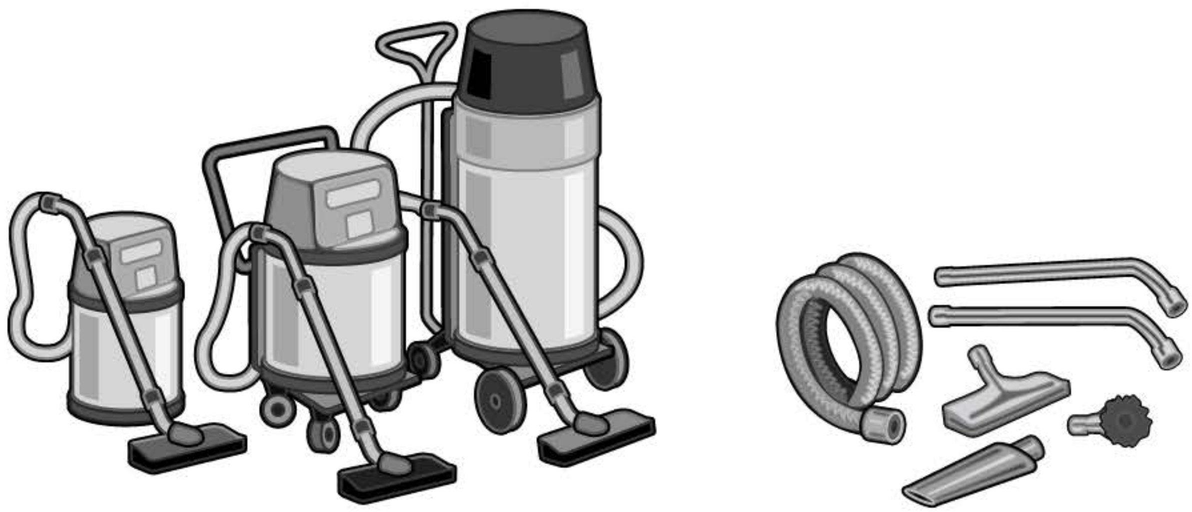


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

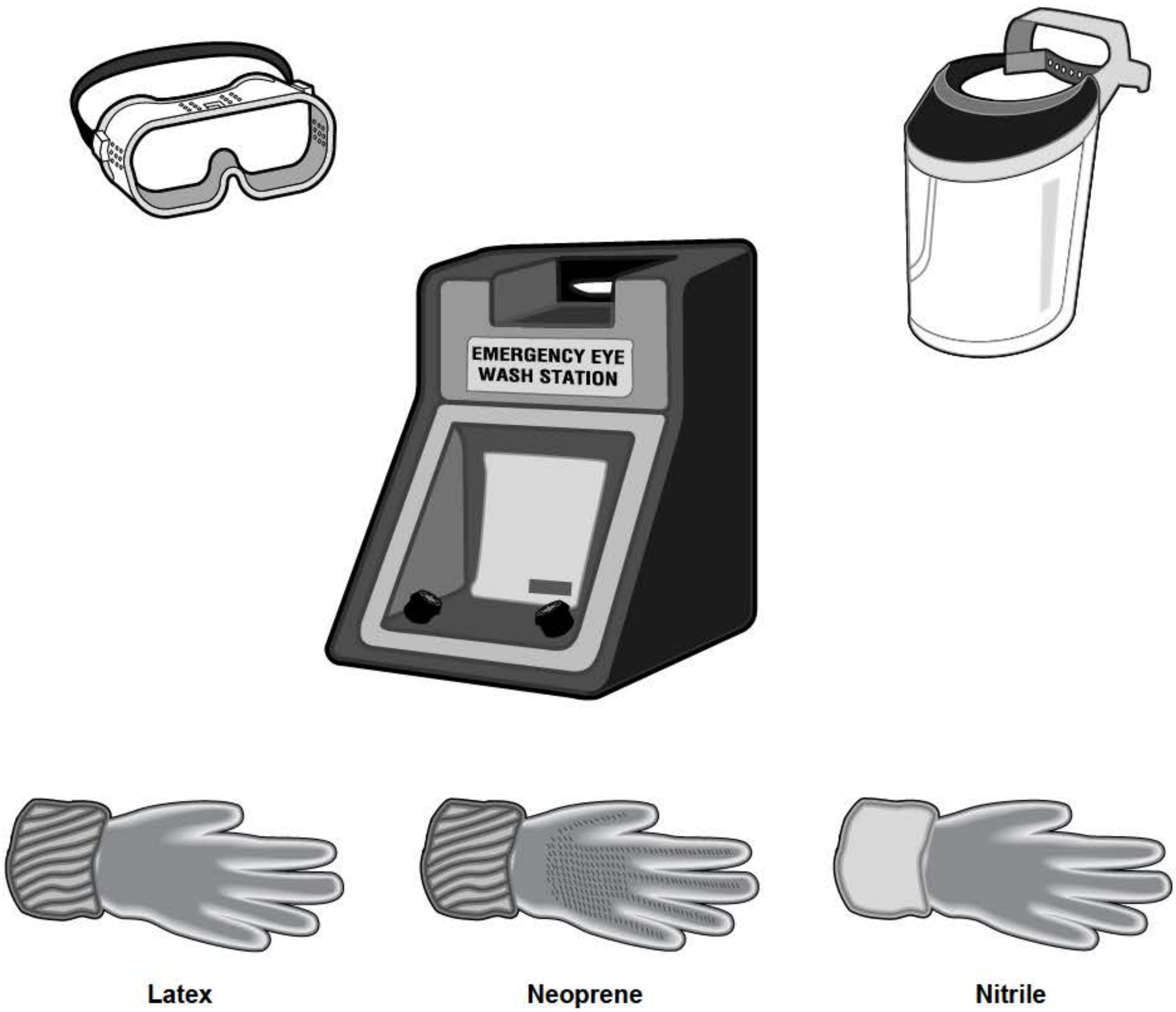
Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

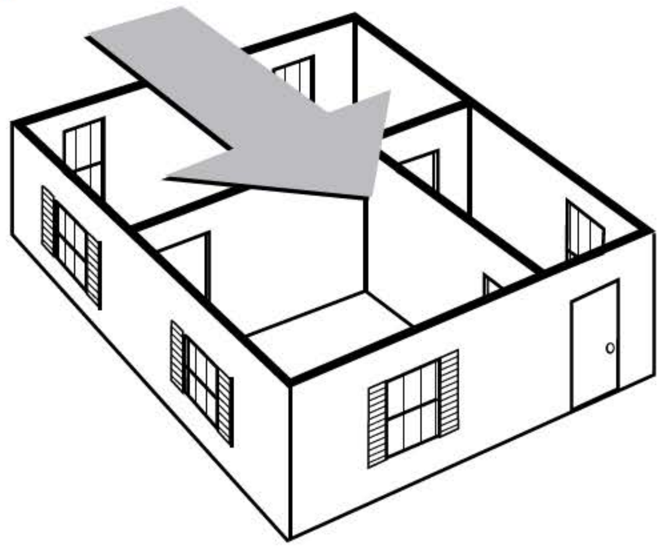
Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

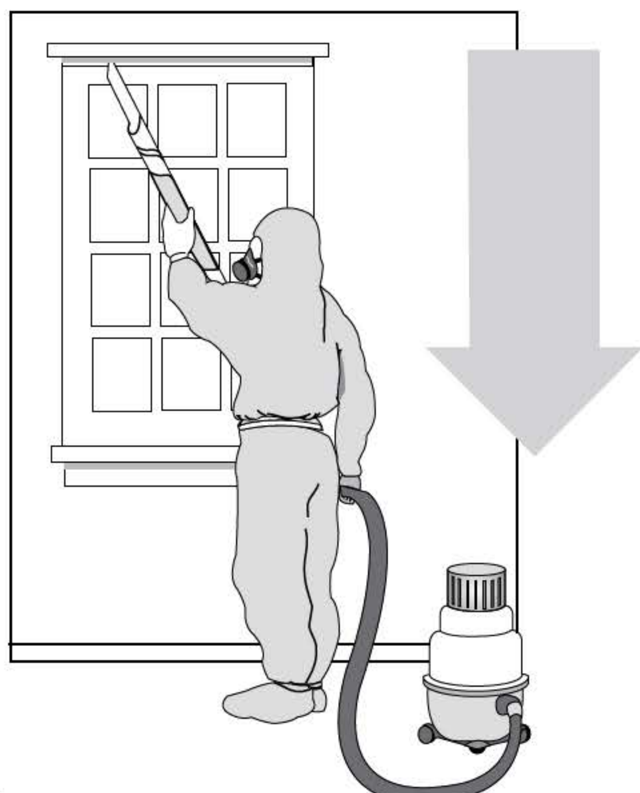
- First, the area is HEPA vacuumed.

Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on, and work down to the floor. Do every inch of the windows, especially the window troughs.



Courtesy: Alice Hamilton Occupational Health Center

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- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.

Rubber Cone

Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

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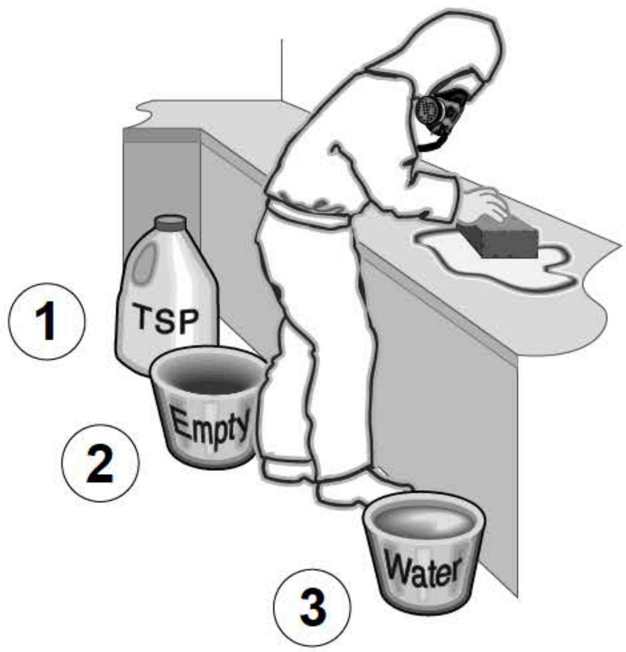
Figure 14.4c (continued)

Wash all surfaces with suitable detergents
Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces

Wet Mop Floor

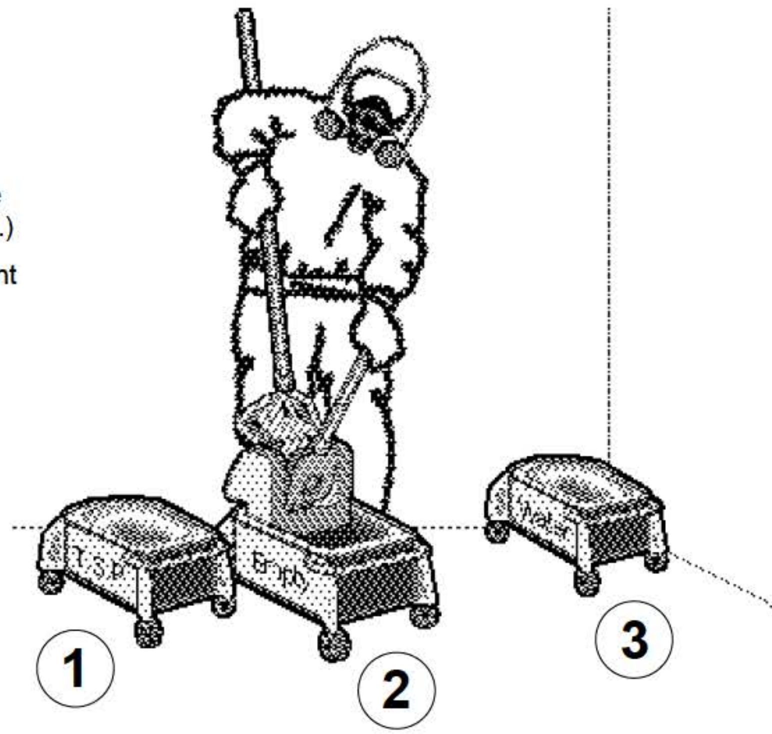
Don't Dry Sweep

Figure 14.4c (continued)

Use the 3-Bucket System.

To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.



Squeeze out the mophead in empty bucket #2. Return to bucket #1 for more detergent solution and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

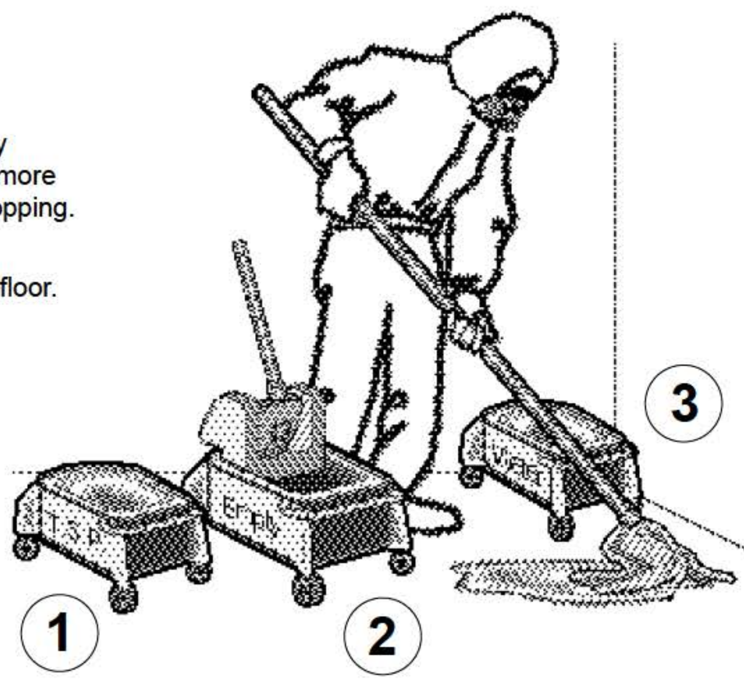
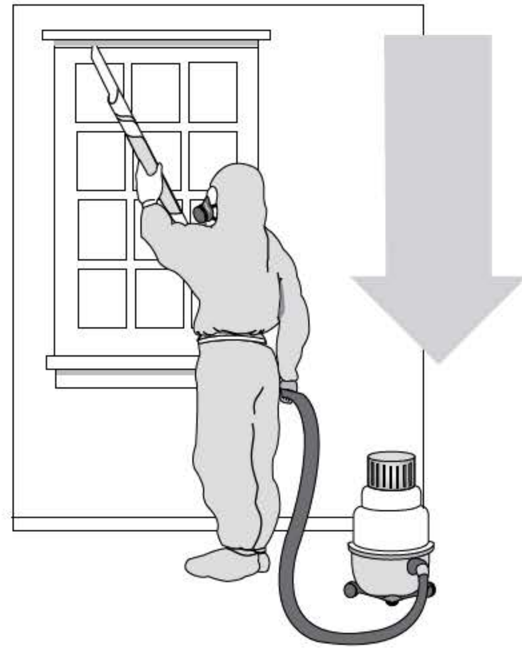


Figure 14.4d (continued)

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

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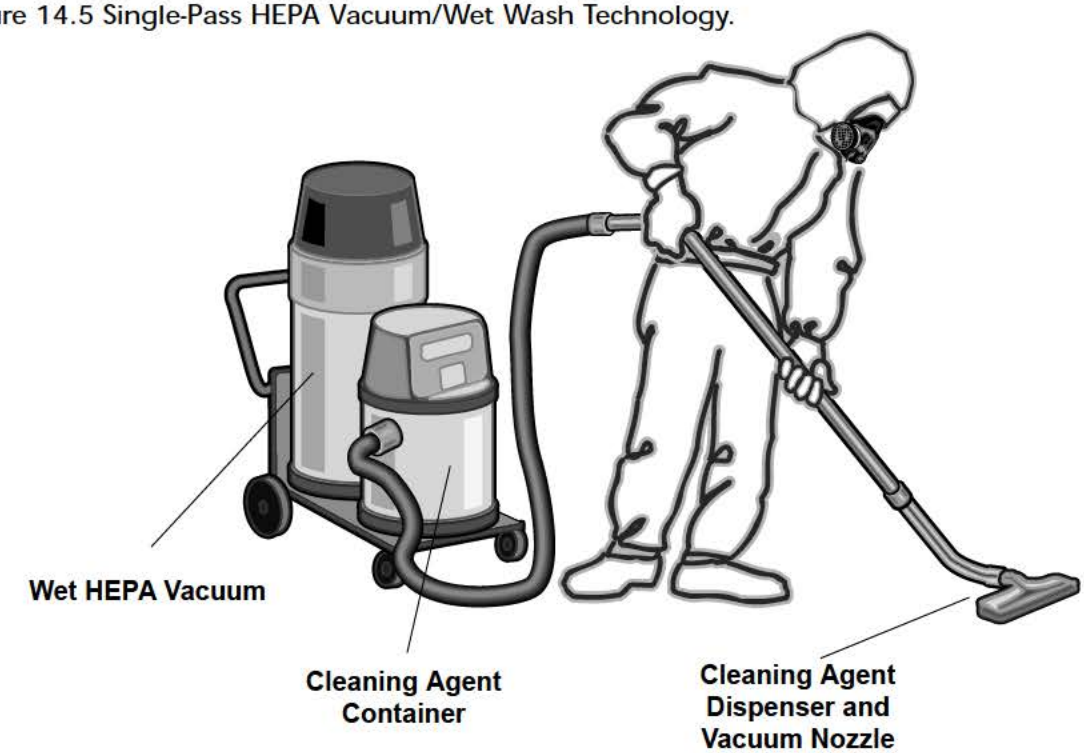
Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.



Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

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belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water *and cleaned.* All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).

Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This

option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dust-retaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table 14.1 Initial Cleaning Wipe-Test Failure Rates for Various Abatement Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)

and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993).

These *Guidelines* do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Cycle Number	Mass Removal Efficiency Percentages			
	Cleaning Method			
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.8	67.0	29.4
5	59.3	88.9	72.1	32.5
6	61.6	91.2	74.4	34.9
7	63.8	93.1	76.4	36.5
8	67.5	95.4	77.5	38.1
9	67.5	97.7	78.7	40.1
10	67.2	100.0	80.2	41.7
11		102.3	80.2	41.7
12		104.6	84.1	44.8
13		104.6	84.5	46.8
14		103.8	84.5	48.4
15				49.6
16				50.8
17				52.4
18				53.6
19				54.4
20				55.2

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) *Effectiveness of Clean-up Techniques for Leaded Paint Dust*

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MDARNG Facilities, Industrial Hygiene Baseline Survey, MG William Witte Armory, Catonsville, MD, Report No. 55-ML-01ED-03/07, 24 July 2003

APPENDIX F

MOLD CLEANING GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

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Readiness thru Health

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

Concern about indoor exposure to mold has been increasing as the public becomes more aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions.

This document provides the best and most current guidance for remediation of clean water damage (<48 hours) and mold contamination (>48 hours) into one resourceful Army guide. This guide has been designed to provide information to facilities management individuals who have little or no experience with mold remediation. It will assist them in making a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to develop or evaluate an in-house remediation plan or evaluate a remediation plan submitted by an outside contractor. If an outside contractor is employed, they must have experience cleaning up mold. Check their references, and have them follow the recommendations presented in this document, EPA guidelines, and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). A multi-disciplinary team approach to mold concerns is best. A health and safety professional, such as an industrial hygienist, should be consulted prior to any remediation activities to assist in the project.

Molds produce tiny spores to reproduce. Mold spores float through the indoor and outdoor air continually. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or uncorrected. There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.(1)

In all situations, the underlying cause of water accumulation must be rectified or mold growth will recur. Any initial water infiltration should be stopped and clean up began immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth. (Refer to Appendix A for detailed guidance on clean water damage response). If the source of water is elevated humidity, actions to maintain the relative humidity levels below 60% to inhibit mold growth should be taken (2). Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilating, and air-conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide adequate drainage and slope the ground away from the foundation.

REMEDIATION PLANNING

- Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Select cleanup methods for moldy items (Appendix B)
- Select Personal Protection Equipment (PPE)- protect remediators (Appendix B)
- Select containment equipment - protect building occupants (Appendix B)
- Select remediation personnel who have the experience and training needed to implement the remediation plan and use PPE and containment as appropriate

REMEDIATE MOISTURE AND MOLD PROBLEMS

- Fix moisture problem, implement repair plan and/or maintenance plan
- Dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Clean and dry moldy materials (Appendix B)
- Discard moldy porous items that can't be cleaned (Appendix B)

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REMEDIATION PROCEDURES

Four levels of abatement are described below. The size of the area impacted by mold contamination primarily determines the type of remediation. The sizing levels below are based on professional judgment and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of mold and preventing dust contaminated with mold from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement. The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. (3)

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be discarded if possible. All materials to be reused should be dry and visibly free from mold. Routine inspections should be conducted to confirm the effectiveness of remediation work. (1 and 3)

The use of bleach or other biocides is questionable in most cases (8). The effectiveness of bleach in reducing living mold is dependent on concentration, residual chlorine levels, and contact time on the surface (8). All of these factors are difficult to control during remediation. Removal of all mold growth can generally be accomplished by physical removal of materials supporting active growth and thorough cleaning of non-porous materials (4). Therefore, application of a biocide serves no purpose that could not be accomplished with a detergent or cleaning agent (4).

The use of gaseous ozone or chlorine dioxide for remedial purposes is **not** recommended. Both compounds are highly toxic and contamination of occupied space may pose a health threat. Furthermore, the effectiveness of these treatments is unproven. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."(4)

FOUR REMEDIATION LEVELS

[Adapted from NYCDOH Guidelines on Assessment and Remediation of Fungi in Indoor Environments (3) and EPA (1)]

Level I: Small Isolated Areas – Total surface area affected less than 10 square feet - e.g., ceiling tiles, small areas on walls. Refer to Appendix B for detailed guidance.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas used by remediation workers for egress should be cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Level II: Medium – Total Surface Area affected between 10 and 100 square feet - e.g., several wallboard panels. (See Appendix B for detailed guidance).

The following procedures *at a minimum* are recommended:

Refer to Appendix C for proper PPE selection. Limited or Full protection may be required depending on the situation.

Refer to Appendix D for Containment procedures.

The work area and areas directly adjacent should be covered with a single layer of 6 mil fire-retardant polyethylene sheet(s) and taped before remediation, to contain dust/debris.

Seal ventilation ducts/grills in the work area and areas directly adjacent with 6 mil polyethylene sheeting. Use an exhaust fan with a High Efficiency Particulate Air (HEPA) filter to generate negative pressurization.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and surrounding areas should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level III be followed.

Level III: Large Area – Total Surface Area affected greater than 100 square feet or potential for increased occupant or remediator exposure during remediation is estimated to be significant. (See Appendix B for detailed guidance).

The following procedures are recommended:

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from occupied spaces using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

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The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft^2) follow Level I guidance for PPE and containment and for a areas (>10 ft^2) follow Medium (Level II) or when greater than 100 ft^2 follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended (7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and removed in double-bagged 6-mil plastic. When a decontamination room is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

All areas should be left dry and visibly free from contamination and debris.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air (4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If remediation sampling is necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HAZARD COMMUNICATION

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

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CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.

3. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water Damage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£	
Water-Damaged Material†	**Actions**
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours§	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans.
Ceiling tiles	• Discard and replace.
Cellulose insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	• Discard and replace.

Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling should be pried away from wall for drying

£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary. † If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist. § The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

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Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

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APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*[1] will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination[2].

Safety Tips While Investigating and Evaluating Mold and Moisture Problems[3]

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate[1].

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems[3].

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination[2].

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air[4]. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control[4]."

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program. For further mold assistance, contact USACHPPM, Industrial Hygiene Field Services Program, DSN 584-3118 or (410) 436-3118.

References

1. USACHPPM Technical Guide 277, *Army Facilities Management Information Document on Mold Remediation Issues*, February 2002.

2. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

3. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

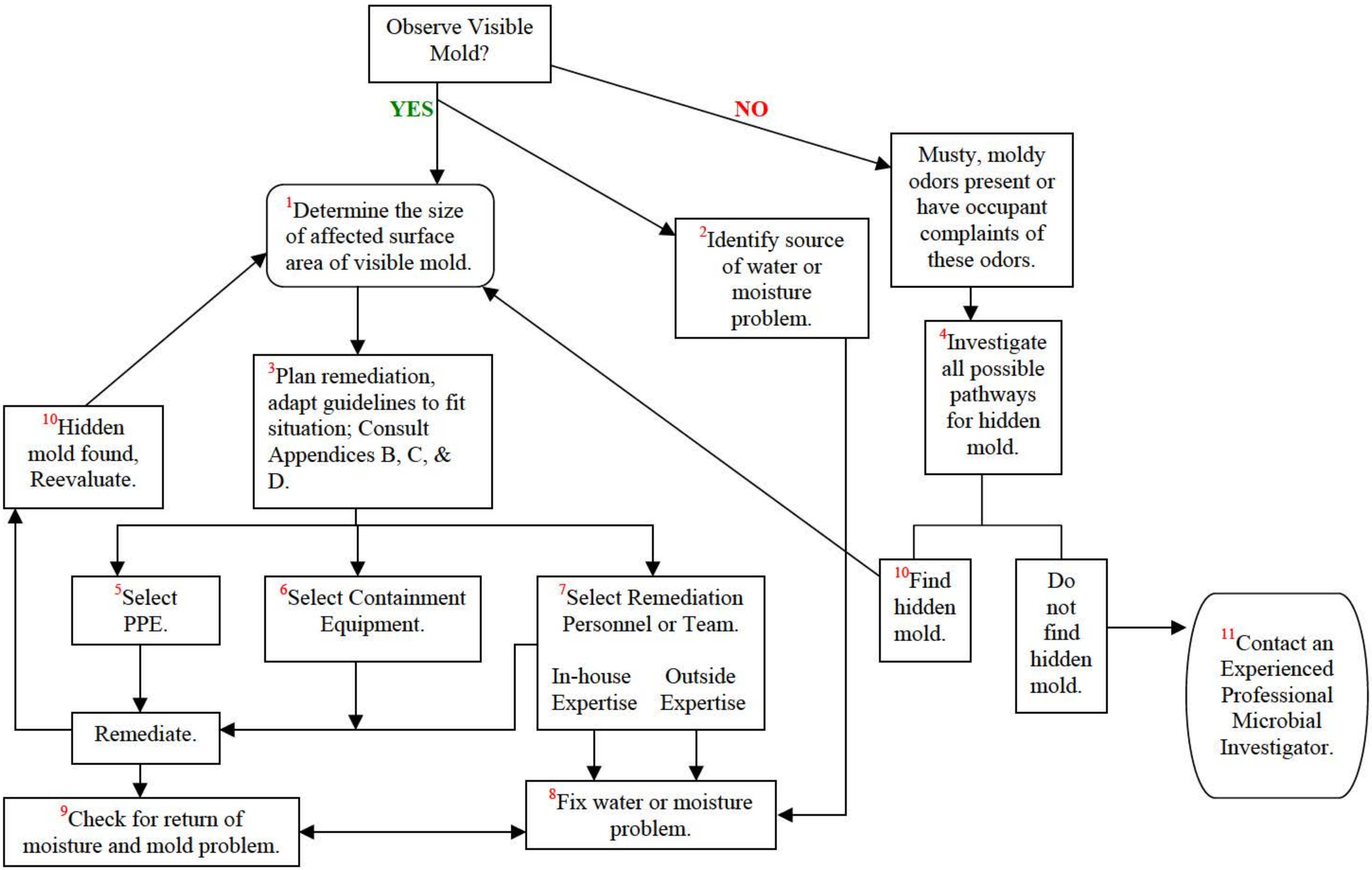
7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

MOLD INVESTIGATION DECISION LOGIC



MOLD INVESTIGATION DECISION LOGIC NOTES:

1. Roughly approximate the total surface area of visible mold. Categorization of the remediation levels are sometimes borderline, so when trying to decide the category to apply, consider the extent of visible growth, such as a heavy blanket of growth on the surface, to barely visible. If heavy growth is apparent, consider moving up to the next level of protection.

2. Do not skip this step. Address the source of water or moisture problem or the mold will simply reappear.

3. Always protect the health and safety of the building occupants and remediators.

4. Mold may be hiding on the backside of drywall, vinyl wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads. Check walls behind furniture, pipe chases and utility tunnels, porous thermal or acoustic liners inside ductwork, or check the rafters (due to roof leaks or insufficient insulation)[3].

5. Utilize appendices B and C for remediation guidance. Use your best judgment during investigations, if not disturbing the mold you may need minimal to no PPE. Do not alarm building occupants unnecessarily, but protect yourself as necessary.

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities[3]. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

®TYVEK, DuPont de Nemours, E.I., & Co., Wilmington, DE.

APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Readiness thru Health

Industrial Hygiene Study

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Report Date: December 30, 2008

Project ID: IHMO080101.03

Non-Responsive [redacted] ________
Manager, Charlotte Operations

Non-Responsive [redacted] ________
Senior Industrial Hygienist

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EXECUTIVE SUMMARY

An industrial hygiene survey was conducted July 31, 2008 at the Readiness Center Facility located in Catonsville, Maryland. The study was performed by Mr. [redacted], CIH.

Employees were not performing tasks that provided excessive noise levels, as such; noise exposure monitoring was not conducted.

Lighting within the facility was also evaluated. Lighting was found to be within applicable recommended levels.

Various surfaces within the HVAC system and throughout the facility were screened for lead. The screening was completed using surface/wipe and air samples. None of the air samples collected were found to have detectable levels of the respective lead contaminant, and five (5) of the six (6) surface samples collected were found to have detectable levels of lead.

Indoor air quality parameters were also evaluated during the assessment. Indoor air quality was found to be within those parameters established by the Environmental Protection Agency (EPA) and American Society of Heating, Refrigerating, and Air-conditioning Engineers, Inc. (ASHRAE). The firing range is inactive, having been converted into a gym, but could have contributed to lead exposure to building occupants. If not addressed, these may provide sources of poor indoor air quality.

During the assessment, written programs for Health and Safety, NESHAP Operations and Maintenance Asbestos Survey, and the Hazard Communication Program were requested for review, however, the onsite personnel was not able to locate the documents.

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Operation Description

The Catonsville Readiness Center primarily serves as an equipment storage facility and is equipped to conduct light vehicle maintenance. The facility consists of a single story response center that contains a maintenance bay, office spaces, classrooms, a kitchen area, an assembly hall, boiler room, lower level exercise room, and unit storage areas.

The exterior walls of the building were constructed of a concrete block system (CBS) finished with red brick. The interior walls were composed of concrete block and in some areas were finished with drywall. The roof of the facility consisted of a flat rubber membrane roof system covered with stone. The heating, ventilating, and air conditioning system (HVAC) consisted of a split direct-expansion (DX) system and a radiator heating system. The floors were composed of a poured concrete slab and in some areas were finished with vinyl floor tiles. The ceilings were generally composed of metal corrugated roof deck and in some areas were finished with a suspended drop ceiling system.

Site personnel at the time of the site assessment consisted of three (3) administrative maintenance personnel. The employees on site were conducting general administrative work.

Noise Survey

Employees were not performing tasks that provided excessive noise levels, as such; noise exposure monitoring was not conducted.

Lead Testing

At the time of the assessment, no activities were observed which may lead to lead exposure other than ammunition handling. The facility contains an indoor firing range that was converted to a gym area. An unused kitchen will be renovated in 2009 was found to have damaged and sloughing paint which was found to be lead containing. Reportedly, a fire in the kitchen occurred several years ago. Elevated lead concentrations were also identified on a wall mounted exhaust fan (fan blades).

Various surfaces within the facility were screened for lead using surface/wipe samples and the collection of air samples. Surface/wipe samples were collected using Ghost Wipe™ samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 µm MCE cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, MD for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix B.

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Lead Testing Results Summary

Location	Air ug/m^3	Surface ug/ft^2	Bulk	Chip %Pb
Range	ND			
Office	ND			
Blank	ND			
Room B1 Closet Wall				ND
Room 106 Kit Wall				0.34%
Room 105 Storage Wall				0.021 %
Drill Hall @ Room 119 Floor		160		
Room 106 Top of Refrigerator		**2600**		
Room B1 Closet Wall		ND		
Room 111 Cabinet Top		110		
Room B2A Cabinet Top		11		
Room B1 Range Exhaust Fan		**33000**		
Blank		ND		
Criteria	**50**	**200**	**5,000**	**0.5**

Key: ND – None Detected
PB – Lead

Deteriorated paint was identified in the kitchen, inside a closet located in the basement level gym and storage room 105 located adjacent to the vehicle maintenance bay. Surface lead was detected in the exhaust fan of the gym/firing range, Drill Hall floor outside of Arms vault 119, Office 111 cabinet and kitchen. The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying contaminated surfaces. In the" Derivation of Wipe Surface Screening Levels for Environmental Chemicals", the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, HUD levels of 40 μg/ft^2 on floors and 250 μg/ft^2 on windowsills should be observed.

No detectable levels of lead were identified in those air samples collected. Currently, OSHA observed an 8-hour time weighted average of 50 ug/m^3.

Lighting

A lighting assessment was conducted throughout the facility. The survey was conducted with large bay doors closed. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. 98047EL). The light meter was last calibrated on February 22, 2008. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Kitchen Room 106	45-68	50	Yes
Restroom Room 107	33-50	5	Yes
Lounge 108	78-96	30	Yes
Office Room 110	83-106	30-50	Yes
Office Room 111	81-109	30-50	Yes
Office Room 112	58-117	30-50	Yes
Office Room 112A	58-73	30-50	Yes
Class Room 116	95-120	30-50	Yes
Storage Room 117	32-51	30-50	Yes
Latrine Room 118	82-111	5	Yes
Locker Room 118A	41-52	7	Yes
Locker Room 121	10-35	7	Yes
Storage Room 122	45-50	30	Yes
Storage Room 124	89-103	30	Yes
Gym Room B1	119-135	30	Yes
Office Room B2	76-105	30-50	Yes
Office Room B2A	10-109	30-50	Yes
Drill Hall 101	33-42	30-50	Yes

Lighting was found to be sufficient throughout the facility.

Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTrak IAQ Meter, Model 8550 (Serial No. 11050). The IAQ Meter was last calibrated in January 2008.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2007). ASHRAE specifies temperature and relative humidity ranges for human comfort (ASHRAE 55-2004). The US Army Technical Guide 277 Army Facilities Management Information

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Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60% in occupied areas.

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 74.3°F to 84.2°F with relative humidity readings ranging from 41.1% to 79.2%. The results of the testing for relative humidity exceeded the US Army guidelines in ten (10) of the sixteen (16) locations tested.

During the survey, CO_2 levels ranged from 373 ppm to 931 ppm within the facility compared to an outdoor CO_2 level of 395 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,095 ppm (395 ppm + 700 ppm). The results of the testing met the ASHRAE guidelines.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Restroom 107	84.2	59.2	497	0
Office 110	76.1	46.6	682	0
Lounge 108	84.2	59.2	580	0
Office 112	77.9	**62.5**	470	0
Office 112A	74.3	58.6	505	0
Latrine 115	78.8	**61.4**	439	0
Office 116	77.0	48.1	378	0
Office 117	79.7	**68.0**	513	0
Locker Room 118A	78.8	**69.7**	497	0
Latrine 118	78.8	**79.2**	435	0
Locker Room 121	77.0	**74.8**	373	0
Storage Room 122	76.1	**73.0**	931	0
Office 124	78.8	**65.7**	584	0
Kitchen 106	84.2	**60.7**	430	0
Gym B1	77.9	**69.5**	450	0
Office B2A	77.0	**71.6**	421	0
Criteria	**73.0-79.0**	**30-50**	**<1,095**	**<9.0**

A visual inspection was conducted throughout visually accessible portions of the facility. The visual inspected was conducted to assess sources or pathways of IAQ. The visual inspection revealed the following items that may be potential sources of poor IAQ:

The kitchen has incurred damage, reportedly by fire. Damaged paint is located on the refrigerator top and floor of adjacent storage room.

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Elevated humidity levels due to absence of exhaust fans have produced condensation/elevated humidity conditions throughout both first floor latrines/locker rooms. Elevated humidity in other areas of the building due to a combination of insufficient exhaust in locker rooms as well as open windows for control of comfort parameters rather than use of window unit air conditioning.

The sub-grade wall located in the closet of Room B1 (Gym) contains significant efflorescence.

Suspect Asbestos Containing Building Materials

Suspect asbestos containing materials include sheetrock/joint compound, plaster wall and ceiling systems, floor tiles and associated mastic, and vinyl covebase. Thermal system insulation was found to be a combination of paper wrapped fiberglass with PVC elbows as well as some canvas wrapped fiberglass TSI in the mechanical room.

Room 122 was found to contain of 9”x9” floor tile in poor condition.

No Management Plan was identified.

Maintenance Bay

The maintenance bay/garage was not found to contain a local exhaust ventilation system. The Maintenance Bay is used for vehicle storage and facility storage.

The maintenance bay was found to contain custodial items, tools, waste motor oil, ladders and flammable storage cabinet. The flammable storage cabinet contained various paints and cleaning solvents.

No PPE was identified in the Maintenance Bay

Items for the kitchen renovation are currently stored throughout the bay.

Ventilation System Assessment

The facility was found to contain a direct expansion package servicing the drill floor. Filters, supply side and interior components were found to contain dust loading.

Individual offices and classrooms were found to have window unit air conditioners and radiator heating. Individual units were found to be clean.

No LEV system was present in the garage.

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Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicated within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and The EI Group, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

References

Title 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration.

Lead - (29 CFR 1910.1025(h))

American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2008 Edition

Industrial Ventilation: A Manual of Recommended Practice for Design, 25th Edition

Georgia Army National Guard: Standard Army Safety and Occupational Health Inspection Checklist; 1 October 1999 Edition

ANSI Z358.1 – 2004, Emergency Eye Wash and Shower Equipment

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007.

RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

National Emission Standard Hazardous Air Pollutants (NESHAP) - The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

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Environmental Protection Agency (EPA) standards (40 Code of Federal Regulations (CFR) 745.227(h)(3))

Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation

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Appendix A

Photographs

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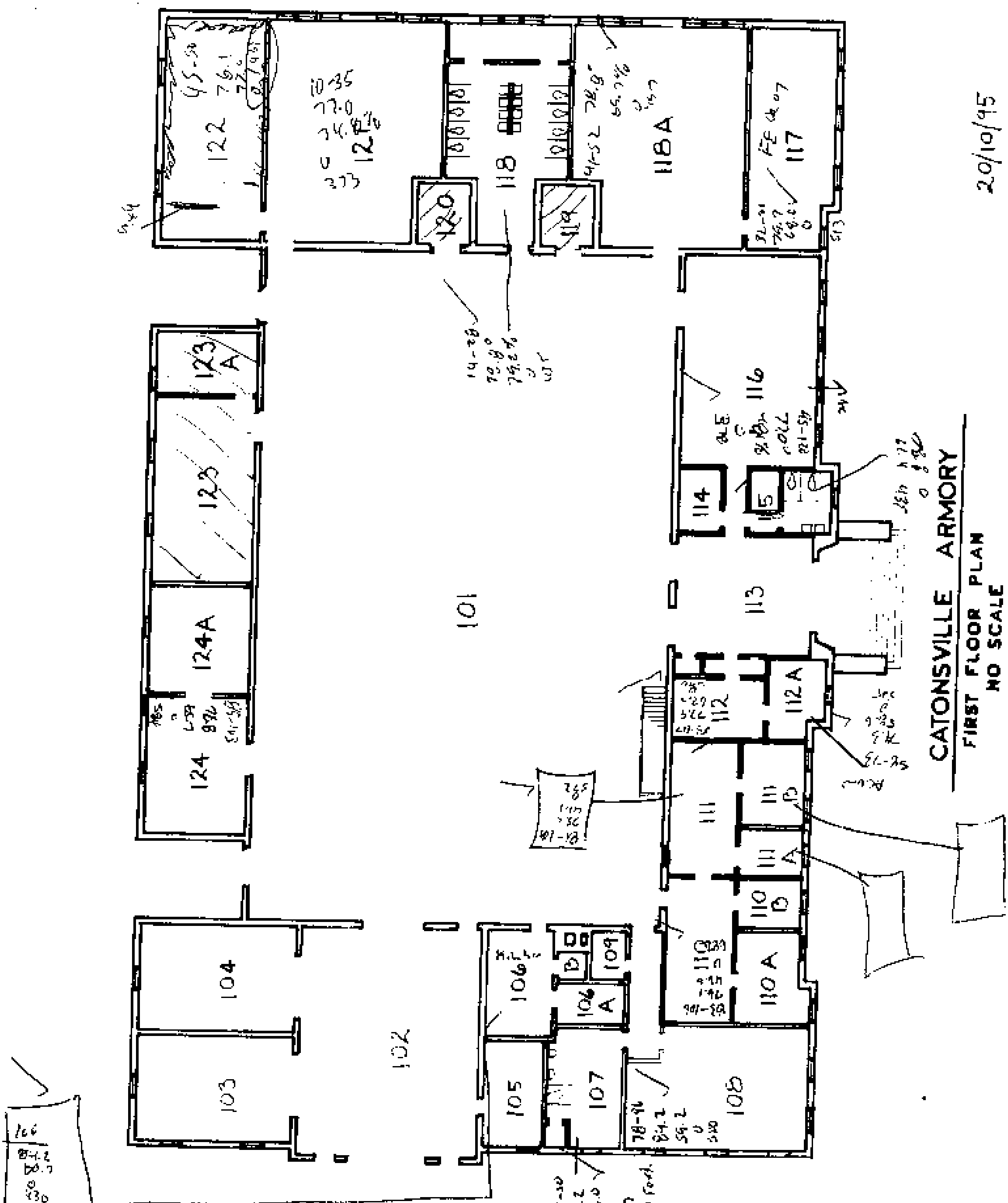
Exterior view of facility

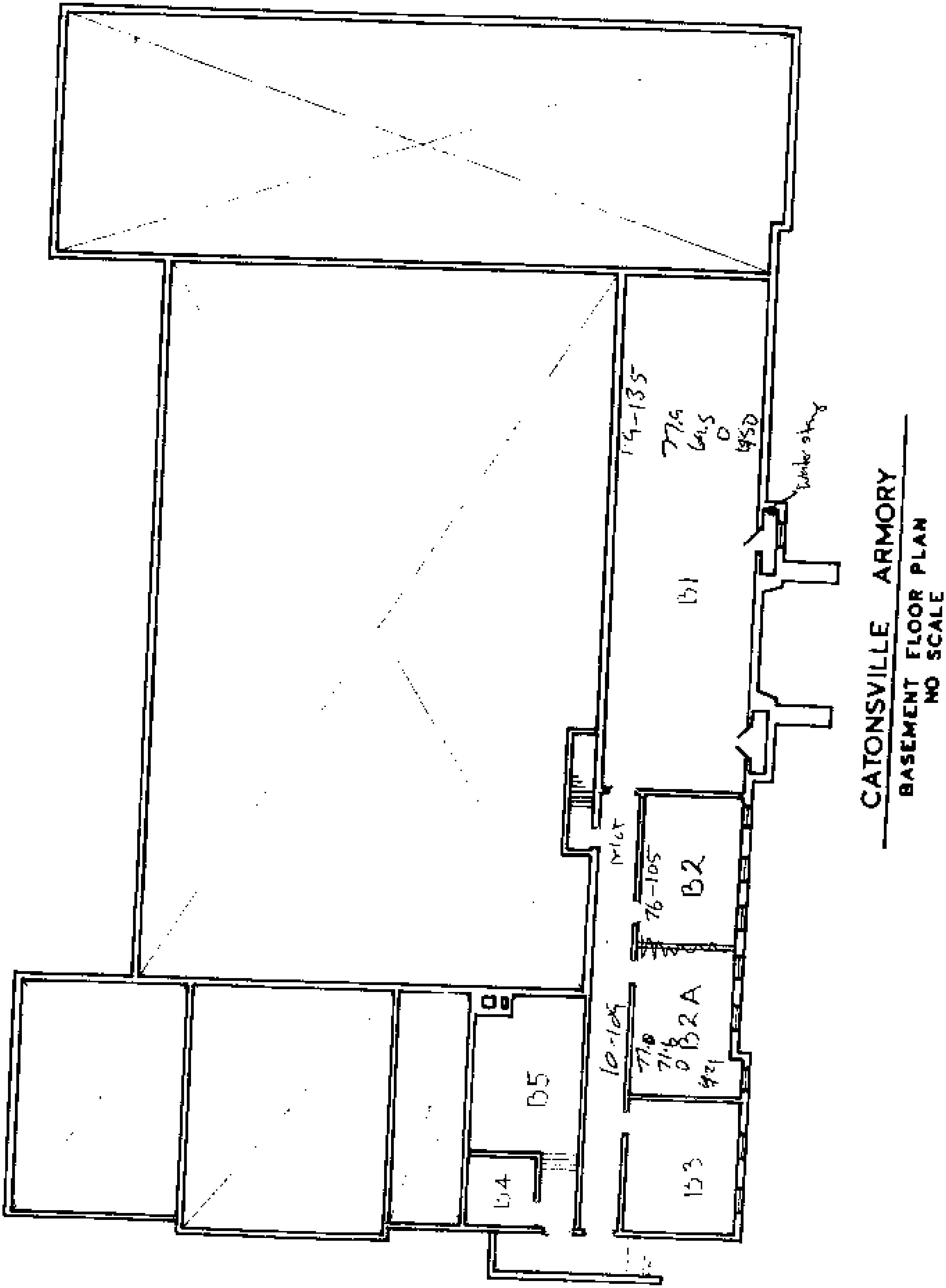
Water intrusion through subgrade wall (Room B1)

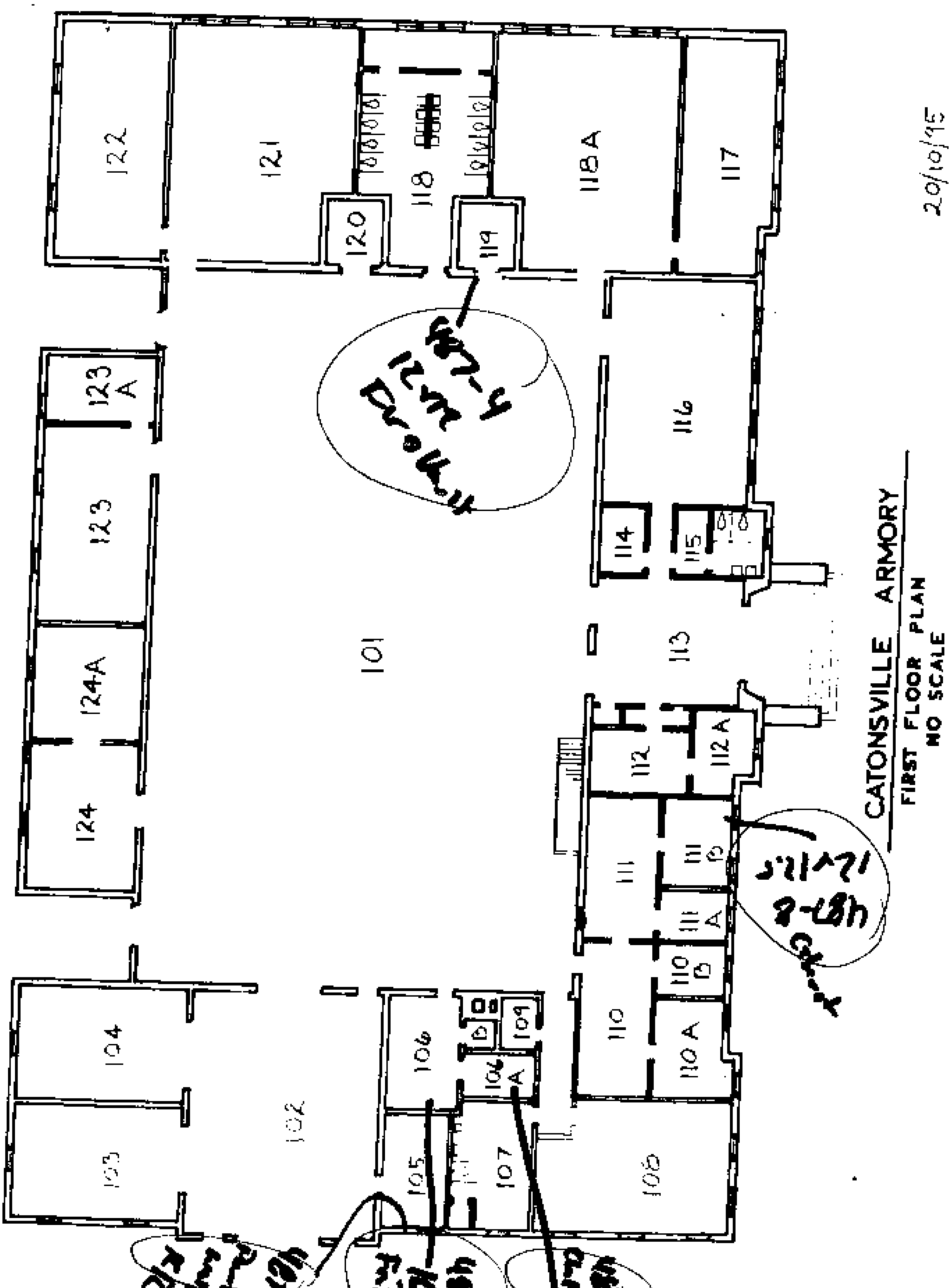
9” x 9” Floor tile located in Room 123 and 123A

Deteriorated paint in kitchen area

View of basement level gym (B1). Formerly firing range.


CATONSVILLE ARMORY
FIRST FLOOR PLAN
NO SCALE
20/10/95
101
102
103
104
105
106
106 A
107
108
109
110
110 A
110 B
111
111 A
111 B
112
112 A
113
114
116
117
118
118 A
122
123
123 A
124
124 A


CATONSVILLE ARMORY
BASEMENT FLOOR PLAN
NO SCALE
B1
B2
B2A
B3
B4
B5
74-135
76-105
10-105



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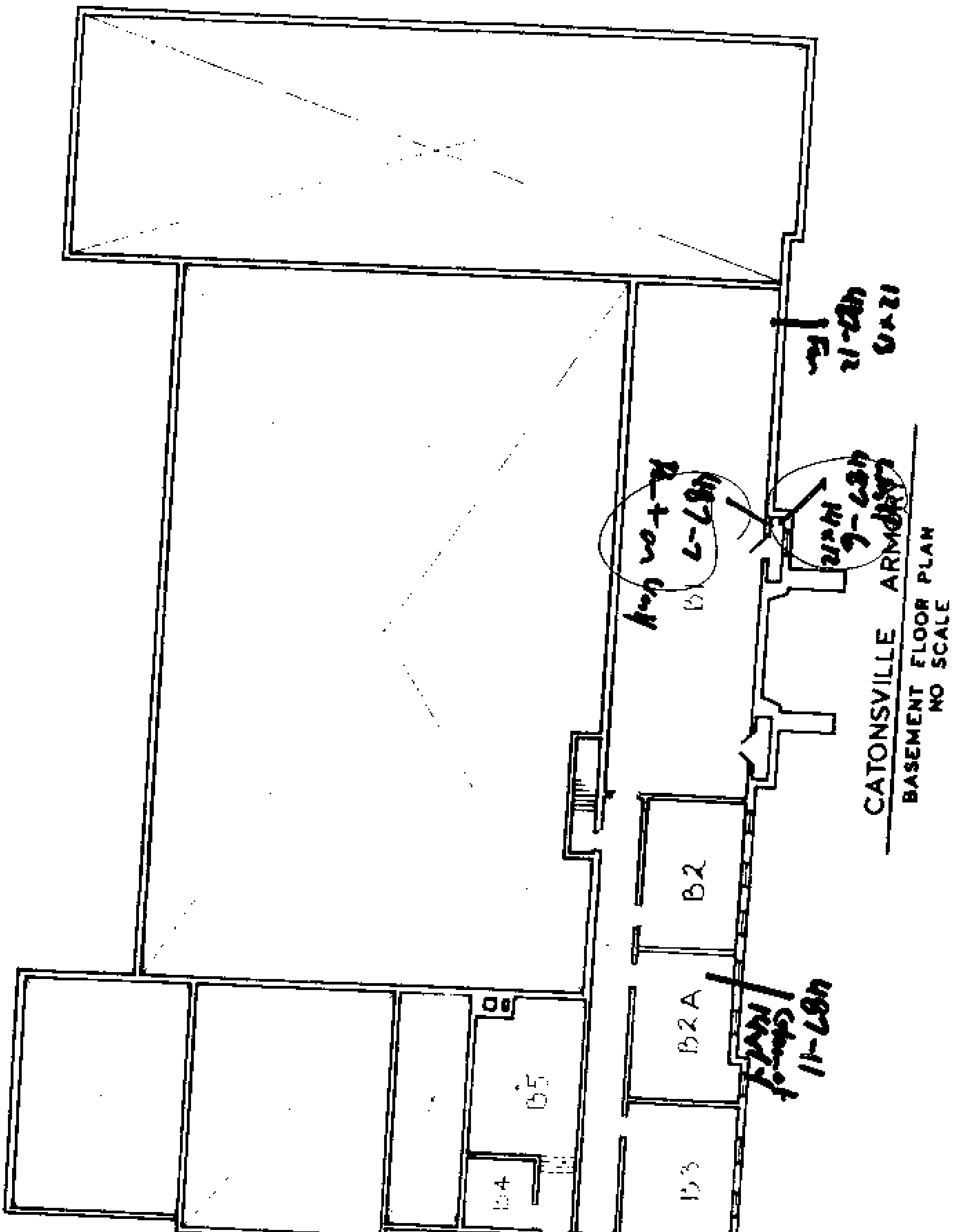

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Appendix B

Laboratory Analysis Report

AMA Analytical Services, Inc.

Invoice: **95261**

Client:	National Guard Bureau	**Job Name:**	RC 487 Catonsville, MD	**Chain Of Custody:**	181404
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008
	State Military Reservation	**Job Number:**	Not Provided	**Date Analyzed:**	9/9/2008
	Havre de Grace, Maryland	**P.O. Number:**	Not Provided	**Date Invoiced:**	9/9/2008
	21078			**Person Submitting:**	[redacted]

Attention: [redacted]

Page 1 of 1

AMA Sample #	Client Sample #	Analysis and Sample Type	Turn Around	Cost	Additional Analysis and Sample Type *	Turn Around *	Additional Cost *	Total Cost
0882232	487-1	AA Lead Air	5 Day +	$8.00				$8.00
0882233	487-2	AA Lead Air	5 Day +	$8.00				$8.00
0882234	487-3	AA Lead Air	5 Day +	$8.00				$8.00
0882235	487-7	AA Lead Paint	5 Day +	$9.00				$9.00
0882236	487-9	AA Lead Paint	5 Day +	$9.00				$9.00
0882237	487-10	AA Lead Paint	5 Day +	$9.00				$9.00
0882238	487-4	AA Lead Wipe	5 Day +	$8.00				$8.00
0882239	487-5	AA Lead Wipe	5 Day +	$8.00				$8.00
0882240	487-6	AA Lead Wipe	5 Day +	$8.00				$8.00
0882241	487-8	AA Lead Wipe	5 Day +	$8.00				$8.00
0882242	487-11	AA Lead Wipe	5 Day +	$8.00				$8.00
0882243	487-12	AA Lead Wipe	5 Day +	$8.00				$8.00
0882244	487-13	AA Lead Wipe	5 Day +	$8.00				$8.00

Sub-Total:	**$107.00**
Additional Charge:	$0.00
Total:	**$107.00**

Note: Payment Due Upon Receipt.

Note: All Accounts over 30 days are subject to a 1½% per month service charge.

* Only apply if additional analysis was performed on the sample(s)

Account Code: NATLG

Remit to: P.O. Box 646, Hanover, Maryland 21076, 410-684-3327

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA Accredited Laboratory — Environmental Lead — See aihalap.org for details — 100470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	RC 487 Catonsville, MD	**Chain Of Custody:**	181404
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	9/9/2008
				Report Date:	9/9/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0882232	487-1	Flame	Air	1055	N/A	2.84	ug/m³	<	2.8	ug/m³	
0882233	487-2	Flame	Air	1027	N/A	2.92	ug/m³	<	2.9	ug/m³	
0882234	487-3	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	
0882235	487-7	Flame	Paint Chip	****	N/A	0.01	%Pb	<	0.011	%Pb	
0882236	487-9	Flame	Paint Chip	****	N/A	0.01	%Pb		0.34	%Pb	
0882237	487-10	Flame	Paint Chip	****	N/A	0.01	%Pb		0.021	%Pb	
0882238	487-4	Flame	Wipe	****	1.000	12.00	ug/ft²		160	ug/ft²	
0882239	487-5	Flame	Wipe	****	0.108	111.52	ug/ft²		2600	ug/ft²	
0882240	487-6	Flame	Wipe	****	1.167	10.29	ug/ft²	<	10	ug/ft²	
0882241	487-8	Flame	Wipe	****	1.042	11.52	ug/ft²		110	ug/ft²	
0882242	487-11	Flame	Wipe	****	1.361	8.82	ug/ft²		11	ug/ft²	
0882243	487-12	Flame	Wipe	****	1.083	11.08	ug/ft²		33000	ug/ft²	
0882244	487-13	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	

An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCREDITED LABORATORY AIHA Environmental Lead See aihaleap.org for details 100470
NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	RC 487 Catonsville, MD	**Chain Of Custody:**	181404
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	9/9/2008
				Report Date:	9/9/2008
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.
Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accrediation applies only to paint chip, wipe, and water samples.

Analyst: Melissa Sampson **Technical Manager:** G Edward Carney

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 16547

Analysis Type:	Flame
Sample Type:	Air
Analysis Date:	9/8/2008

		Result		Percent Recovery	RPD	Comment
Preparation Blank		-0.103	ppm			Acceptable
Report Limit Verification Sample		0.2194	ppm	87.8%		Acceptable
Expected Spike Level (ppm)	0.25					
Duplicate Sample 1		#Num!	mg/Kg			
Duplicate Sample 2		#Num!	mg/Kg		#Error	#Error
Matrix Spike Analysis						
Spiked Sample				106.15%		Acceptable
Spike Duplicate				104.70%	1.38%	Acceptable
Laboratory Control Sample 1		110.689	µg	105.18%		Acceptable
Laboratory Control Sample 2		113.155	µg	103.75%	1.36%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.99991

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
180767	82077	N0276-01
180767	82078	N0276-02

SDG Number: 16547

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
180767	82079	N0276-03
181402	82217	NGA-01-A
181402	82218	NGA-02-A
181402	82219	NGA-03-A
181404	82232	487-1
181404	82233	487-2
181404	82234	487-3
181417	82245	492-2
181417	82246	492-1
181417	82247	492-3
503172	82261	9408LBP-1
503172	82262	9408LBP-2
503173	82263	9208LBP-1
503173	82264	9208LBP-2
503174	82265	9508LBP-1
503174	82266	9508LBP-2
503175	82267	9308LBP-1
503175	82268	9308LBP-2

SDG Number: 16547

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 16552

Analysis Type:	Flame
Sample Type.	Paint Chip
Analysis Date:	9/8/2008

		Result		Percent Recovery	RPD	Comment
Preparation Blank		-0.031	ppm			Acceptable
Report Limit Verification Sample		0 3418	ppm	102 6%		Acceptable
Expected Spike Level (ppm)	0.3333					
Duplicate Sample 1		9723	mg/Kg			
Duplicate Sample 2		8821	mg/Kg		9.73%	Acceptable
Matrix Spike Analysis						
Spiked Sample				92.45%		Acceptable
Spike Duplicate				94 00%	1 66%	Acceptable
Laboratory Control Sample 1		528 377	µg	110 78%		Acceptable
Laboratory Control Sample 2		429 110	µg	94 52%	15.84%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0 999853

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181397	81909	486-11
181397	81910	486-12

SDG Number: 16552

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181397	81911	486-13
181397	81912	486-14
181430	82200	495-L-4
181430	82201	495-L-6
181430	82202	495-L-7
181430	82203	495-L-10
181430	82204	495-L-11
181404	82235	487-7
181404	82236	487-9
181404	82237	487-10
181417	82254	C1
181417	82255	C2
176586	82328	CBC080908-10
176586	82329	CBC080908-11

SDG Number: 16552

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 16554

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	9/9/2008

		Result		Percent Recovery	RPD	Comment
Preparation Blank		-0.041	ppm			Acceptable
Report Limit Verification Sample		0.2835	ppm	85.1%		Acceptable
Expected Spike Level (ppm)	0.3333					
Duplicate Sample 1		#Num!	mg/Kg			
Duplicate Sample 2		#Num!	mg/Kg		#Error	#Error
Matrix Spike Analysis						
Spiked Sample				98.87%		Acceptable
Spike Duplicate						Acceptable
Laboratory Control Sample 1		286.769	µg	102.00%		Acceptable
Laboratory Control Sample 2		315.385	µg	102.18%	0.18%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999874

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181404	82238	487-4
181404	82239	487-5

SDG Number: 16554

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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181404	82240	487-6
181404	82241	487-8
181404	82242	487-11
181404	82243	487-12
181404	82244	487-13
182423	82288	DE080818-01
182423	82289	DE080818-02
182423	82290	DE080819-01
182423	82291	DE080819-02
182423	82292	DE080820-07
182423	82293	DE080826-01
182423	82294	DE080826-02
182423	82295	DE080826-03
182423	82296	DE080826-04
182423	82297	DE080826-05

SDG Number: 16554

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EI

SAMPLE CHAIN OF CUSTODY

DATE SHIPPED	# OF SAMPLES	SAMPLE MEDIA TYPE	PROJECT NAME
	13		Catonsville 181400

CONTACT	TELEPHONE NUMBER

SAMPLE # OR AREA	SAMPLE DATE	SAMPLE VOLUME	ANALYSIS REQUESTED
487-1	7/31/08	1055.36	Lead-Air
487-2		1027.53	
487-3		0	
487-7		—	Lead-Chip
487-9		—	
487-10		—	
487-4		144 in²	Lead-wipe
487-5		100 cm²	
487-6		168 in²	
487-8		150 in²	
487-11		196 in²	
487-12		156 in²	
487-13		0	
~~487~~			

	Signature	Date
Samples Relinquished By:	[signature]	8/01/08
Samples Received By:		
Samples Analyzed By:		

Catonsville

AMA Analytical Services, Inc.
Focused on Results
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 181404

Mailing/Billing Information:
1. Client Name: National Guard Bureau NE
2. Address 1: 301-1H Old Bay Lane
3. Address 2: Havre de Grace, MD 21078
4. Address 3:
5. Phone #: 336 455 2558 Fax #: 704 593 1650

Submittal Information:
1. Job Name: RC 487 Catonsville, MD
2. Job Location:
3. Job #: [redacted] P.O. #:
4. Contact Person [redacted] @ phone # 336 455 2558
5. Submitted by: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ____ ☐ 24 Hours Time Due: ____ Comments: ____	☐ Immediate ☐ 3 Day ☐ Next Day ☒ 5 Day • 9/11/08 ☐ 2 Day Date Due: ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☐ Include COC/Field Data Sheets with Report ☒ Email: VMaisto @ ei2.com ☐ Fax: ☐ Verbals:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ NIOSH 7400________(QTY)
☐ Fiberglass________(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ AHERA________(QTY)
☐ NIOSH 7402________(QTY)
☐ Other (specify________)________(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate________(QTY)
☐ EPA Point Count________(QTY)
☐ NY State Friable 198.1________(QTY)
☐ Grav. Reduction ELAP 198.6________(QTY)
☐ Other (specify________)________(QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield________(QTY)
☐ NY State PLM/TEM________(QTY)
☐ Residual Ash________(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust________(QTY)
☐ Quan. (s/area) Vacuum D5755-95________(QTY)
☐ Quan. (s/area)Dust D6480-99________(QTY)
TEM Water
☐ Qual. (pres/abs)________(QTY)
☐ ELAP 198.2/EPA 100.2________(QTY)
☐ EPA 100.1________(QTY)

☐ All samples received in good condition unless otherwise noted.
(TEM Water samples ______°C)

Lead Analysis
☒ Paint Chip 3 (QTY)
☒ Dust Wipe (wipe type________) 7 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid________(QTY)
☐ TCLP________(QTY)
☐ Drinking Water________(QTY)
☐ Waste Water________(QTY)
☐ Dust Wipe Furnace (wipe type________)________(QTY)

Mold - Direct Microscopic Analysis
☐ Collection Apparatus for Spore Traps:________
☐ Spore-Trap____(QTY) ☐ Bulk____(QTY)
☐ Surface Swab____(QTY) ☐ Surface Vacuum Dust____(QTY)
☐ Surface Tape____(QTY) ☐ Other (Specify____)____(QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	STORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
	See Attached																Date/Time: Contact: By:
																	Date/Time: Contact: By:
																	Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 9/4/08 @ 800 Via: UPS By (Print): M. Sampson Sign: [signature]
2. Date/Time Analyzed: __/__/__ @ ____ By (Print): ________ Sign: ________
3. Results Reported To: ________ Via: ________ Date: __/__/__ Time: ________ Initials: ____
4. Comments: ________

National Guard Region North

National Guard Readiness Center
Industrial Hygiene Evaluation
Catonsville Army National Guard Armory
Catonsville, MD 21228-5142

Prepared for:

National Guard Region North
Industrial Hygiene Office
301 Old Bay Lane
Havre De Grace, MD 21078

Attn: [redacted]

Prepared by:

Bonus Environmental, LLC
P.O. Box 121
Mt. Pleasant, Michigan 48804

Project No. 1061-03
August 4, 2010

Bonus Environmental, LLC

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TABLE OF CONTENTS

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APPENDICES

BONUS ENVIRONMENTAL

August 4, 2010
Project No. 1061-03

National Guard Region North
Industrial Hygiene Office
301 Old Bay Lane
Havre De Grace, MD 21078-4003

Attn: [redacted]

Project: Army National Guard Readiness Center, Industrial Hygiene Evaluation
Catonsville Army National Guard Armory

1.0 - EXECUTIVE SUMMARY

Bonus Environmental, LLC was contracted by the National Guard Bureau Region North to identify and measure the existence and extent of potentially hazardous operations or conditions at the Catonsville Army National Guard Readiness Center located at 130 Mellor Avenue in Catonsville, Maryland. The purpose of this evaluation was to generate or to update a previous baseline evaluation so that employee exposure history can be provided to each civilian and military employee. The following industrial hygiene and safety programs were evaluated during this industrial hygiene evaluation performed by Bonus Environmental, LLC representative [redacted] on May 14, 2010:

- Indoor Air Quality
- Use of items on the Hazardous Materials List
- Vehicle maintenance activities
- Lead Wipe & Air Sampling
- Illumination
- Ergonomics
- Evaluation of the physical condition of the facility in regards to peeling paint, asbestos containing materials, water damage or mold problems, and housekeeping practices.

The Catonsville Readiness Center is an Army National Guard armory comprised of offices, a drill hall, a kitchen, a classroom, locker rooms, storage rooms, and a fitness room. The point of contact for this facility was SFC David Dubois. Four (4) full-time administrative personnel are employed in the approximately 25,900 ft² facility. A shop diagram depicting the locations of the operations identified during this industrial hygiene evaluation is attached to this report as Appendix A.

The National Guard Bureau Region North Industrial Hygiene Office provided governmental furnished equipment and sampling media required to perform the industrial hygiene evaluation. Chain of custody forms for laboratories approved by the National Guard Bureau Region North Industrial Hygiene Office were provided with the sampling media. All samples collected during this industrial hygiene evaluation were sent to the National Guard Bureau Region North Industrial Hygiene Office approved laboratories for analysis.

2.0 – LEAD SAMPLING

2.1 – Lead Wipe Sampling

Lead wipe sampling was performed according to the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame). Seventeen (17) wipe samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. The National Guard Bureau Region North Industrial Hygiene Office has established/interpreted a threshold of 200 µg/ft² of lead concentration for surface cleanliness. The following table outlines the locations and analytical results for the lead wipe samples collected during this project

Army National Guard – Catonsville Readiness Center Lead Wipe Sample Results				
Sample #	***Sample Date***	***Sample Location***	***Sample Area (ft^2)***	***Sample Result ($\mu g/ft^2$)***
CV-W-1	5-14-10	Field Blank	---	< 12
CV-W-2	5-14-10	Drill hall, SE corner, on podium outside of room 111	0.111	< 110
CV-W-3	5-14-10	Drill hall, east wall, top of drinking fountain	0.111	< 110
CV-W-4	5-14-10	Drill hall, north wall, top of basketball hoop retractor box	0.111	< 110
CV-W-5	5-14-10	Drill hall, floor, north “free throw” line	0.111	< 110
CV-W-6	5-14-10	Drill hall, floor, south “free throw” line	0.111	< 110
CV-W-7	5-14-10	Kitchen room 106, east wall, top of “Panel F” control box	0.111	< 110
CV-W-8	5-14-10	Room B3, SW corner, desk surface	0.111	< 110
CV-W-9	5-14-10	Room B1 (Fitness room, former indoor firing range), NE corner, east wall, exhaust ventilation fan blade	0.111	10,000
CV-W-10	5-14-10	Room B1 (Fitness room, former indoor firing range), west side-center of room, on light fixture	0.111	< 110
CV-W-11	5-14-10	Room B1 (Fitness room, former indoor firing range), south side, top of “speed bag” fixture	0.111	< 110
CV-W-12	5-14-10	Room B1 (Fitness room, former indoor firing range), center of room, floor	0.111	< 110
CV-W-13	5-14-10	Hallway outside of room B1, NW corner of hallway, top of “Panel B” box	0.111	< 110
CV-W-14	5-14-10	Room 108, west side, on bar counter top	0.111	< 110
CV-W-15	5-14-10	Lobby area 113, NE corner, NE corner, top of heating register	0.111	< 110
CV-W-16	5-14-10	Room 118A, west side, top of locker 176	0.111	140
CV-W-17	5-14-10	Room 121, along north wall, desk surface	0.111	< 110
CV-W-18	5-14-10	Room 102, SW corner, top of “Diesel pump” circuit breaker box	0.111	560

Surface cleanliness threshold = < 200 µg/ft²

2.2 – Lead Air Sampling

The purpose of lead air monitoring was to document task-specific activities and corresponding exposures to lead. Occupational Safety and Health Administration (OSHA) 29 CFR 1926.62 requires employers whose employees are exposed to lead in the work place, in any quantity, make a determination whether any employee's exposure exceeds the action level (AL) of 30 µg/m^3 or the maximum permissible exposure limit (PEL) of 50 µg/m^3 as 8-hour time weighted averages (TWAs). If employee exposures are less than 30 µg/m^3, training is required under the Hazard Communication 29 CFR 1926.59. Exposures that exceed the AL or PEL require the employer to comply with additional requirements, including air monitoring, additional training, and restricted work practices as outlined in OSHA 29 CFR 1926.62.

Representative fixed area sampling was conducted for potential airborne concentrations of lead in accordance with accepted Industrial Hygiene methods recognized by the National Institute for Occupational Safety and Health (NIOSH) and OSHA.

Lead exposure monitoring was performed in accordance with the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame) with SKC personal air sampling pumps calibrated to 2.0 liters per minute. All samples were collected on 37 mm diameter cassettes with mixed-cellulose ester filters. All sampling pumps were calibrated before and after each use to ensure volume accuracy. Two (2) samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. Analytical results of the lead wipe and air samples are attached to this report as Appendix B.

Army National Guard – Catonsville Readiness Center
Lead Air Sample Results

Sample #	Sample Type	Sample Location	Flow Rate	Start	Stop	Vol.	Reprt. Limit (µg/m³)	Results (µg/m³)	8 hr TWA (µg/m³)
May 14, 2010									
CV-A-1	FB	Field Blank	---	---	---	0	3	< 3	N/A
CV-A-2	IWA	Drill hall, SE corner, outside of room 110	2.0	0853	1538	810	3.7	< 3.7	N/A
CV-A-3	IWA	Room B1 (Fitness room, former indoor firing range), north end, east side along wall	2.0	0854	1539	810	3.7	< 3.7	N/A

PS = Personal sample, **IWA** = Inside work area, **N/A** = Not Applicable
Note: The OSHA PEL of 50 µg/m³ is averaged over an 8 hr work shift

3.0 - PHYSICAL CONDITION OF FACILITY / PERSONNEL CONCERNS

3.1 - Lead Based Paint

During the industrial hygiene evaluation of the Army National Guard Catonsville Readiness Center, Bonus Environmental, LLC performed a visual inspection of the facility in regards to lead based paint. Bonus Environmental, LLC identified no areas of peeling paint which could potentially pose a lead exposure hazard.

3.2 – Presumed Asbestos Containing Materials

During the industrial hygiene evaluation of the Army National Guard Catonsville Readiness Center, Bonus Environmental, LLC performed a visual inspection to identify presumed asbestos containing materials (PACM) and, if found, to note their condition. Bonus Environmental, LLC did not identify any PACM that was considered to be in poor or damaged condition.

3.3 - Water Damage/Mold Growth

During the industrial hygiene evaluation of the Army National Guard Catonsville Readiness Center, Bonus Environmental, LLC performed a visual inspection to report the location and perform an evaluation of any water damaged or visible mold problems. Bonus Environmental, LLC identified no water-damaged and/or moldy building materials during the survey.

3.4 - Housekeeping

During the industrial hygiene evaluation of the Army National Guard Catonsville Readiness Center, Bonus Environmental, LLC performed an evaluation of the housekeeping practices. Bonus Environmental, LLC found the housekeeping to be in good order.

3.5 – Employee Interviews

During the industrial hygiene evaluation of the Army National Guard Catonsville Readiness Center, Bonus Environmental, LLC performed interviews and made observations to determine if the work activities being performed possessed any ergonomic concerns. Following the interviews and observations, no concerns or employee complaints were identified.

3.6 – Indoor Air Quality

During the industrial hygiene evaluation of the Army National Guard Catonsville Readiness Center, Bonus Environmental, LLC measured temperature, relative humidity, carbon monoxide (CO), and carbon dioxide (CO_2) throughout the facility. A calibrated TSI Q-Trak Model 7565 Indoor Air Quality Monitor equipped with a Q-Trak Probe 982 was utilized to record indoor air quality measurements.

Carbon dioxide is a natural component of air and the amount of CO_2 in a given air sample is commonly expressed as parts per million (ppm). The outdoor air in most locations contains about 380 ppm carbon dioxide. Higher outdoor CO_2 concentrations can be found near vehicle traffic areas, industry and sources of combustion. The concentrations of CO_2 found in most offices are well below the OSHA Permissible Exposure Limit (PEL) of 5,000 ppm when averaged over an 8-hour time period for an industrial workplace. While levels below 5,000 ppm are considered to pose no serious health threat, studies have indicated that individuals in offices with elevated CO_2 concentrations tend to report drowsiness, lethargy and a general sense that the air is stale. Ventilation rates for office spaces are defined by various codes and standards. The most widely accepted standard is the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 62. According to ASHRAE Standard 62.1-2007, CO_2 concentrations below 700 ppm above the outdoor level are considered to indicate adequate ventilation and provide human comfort. The CO_2 measurements collected during this industrial hygiene evaluation ranged from 406 ppm to 679 ppm and indicate adequate ventilation within the facility.

Carbon monoxide, also known as the "silent killer," is a colorless, odorless, poisonous gas that results from the incomplete burning of common fuels such as natural or liquefied petroleum gas, oil, wood or coal. When carbon monoxide is inhaled, it enters the blood stream and reduces the ability of the blood to carry oxygen to vital organs, such as the heart and brain. Because it is impossible to see, taste or smell the toxic fumes, CO can harm you before you are aware it is in your work area. At lower levels of exposure, CO causes mild effects that are often mistaken for the flu. These symptoms include headaches, dizziness, disorientation, nausea and fatigue. The effects of CO exposure can vary greatly from person to person depending on age, overall health and the concentration and length of exposure. The OSHA has established a PEL of 50 ppm. OSHA standards prohibit worker exposure to more than 50 parts of the gas per million parts of air averaged during an 8-hour time period. The peak CO level for employees is 200 ppm. The CO measurements collected during this industrial hygiene evaluation ranged from 0.9 ppm to 1.6 ppm. CO levels were well below the OSHA PEL during this industrial hygiene evaluation.

During the industrial hygiene evaluation of the Army National Guard Catonsville Readiness Center, Bonus Environmental, LLC collected temperature measurements. Temperature measurements throughout the facility ranged from 65.7ºF to 71.5ºF and are considered to be within an acceptable range.

During the industrial hygiene evaluation of the Army National Guard Catonsville Readiness Center, Bonus Environmental, LLC collected relative humidity measurements. Relative humidity measurements throughout the facility ranged from 58.6% to 78.7% and are considered to be within an acceptable range. Indoor air quality measurements recorded during this industrial hygiene evaluation are summarized in the table below.

Army National Guard – Catonsville Readiness Center
Indoor Air Quality Measurements

Location	*CO_2 (ppm)*	*CO (ppm)*	*Relative Humidity (%)*	*Temperature (ºF)*
Outdoors, east side of building	388	1.8	80.5	65.5
Lobby area 113	416	1.5	78.7	66.8
Boiler room B5	415	1.6	72.8	71.5
Fitness room B1	439	0.9	58.6	68.1
Room 108	430	1.2	65.6	67.9
Room 110	679	1.1	60.7	68.6
Drill hall room 101	417	1.3	69.8	68.1
Room 116	414	1.4	70.5	67.8
Room 121	428	1.2	63.2	66.4

Army National Guard – Catonsville Readiness Center ***Indoor Air Quality Measurements***				
Location	*CO_2 (ppm)*	*CO (ppm)*	*Relative Humidity (%)*	*Temperature (ºF)*
Room 104	406	1.2	71.3	65.7
Kitchen room 106	461	1.3	74.8	66.4

Required/Recommended Values
CO_2 *- OSHA PEL = 5,000 ppm and ASHRAE Standard 62.1-2007 = no greater than 700 ppm above outdoor*
CO *- OSHA PEL = 50 ppm and OSHA Ceiling Limit = 200 ppm*
Temperature *- ASHRAE Standard 55-2004 = between approximately 67 and 82 °F.*
RH *– ANSI/ASHRAE Standard 62.1-2007 = <65%*

4.0 – LIGHTING

Utilizing a properly calibrated Cooke Corporation cal-Light 400 light meter, Bonus Environmental, LLC collected illumination readings throughout the facility. Illumination measurements recorded during this industrial hygiene evaluation are summarized in the table below.

Army National Guard – Catonsville Readiness Center ***Lighting Survey***			
Location	*Measurement in Foot Candles*	*Requirement in Foot Candles*	*Requirement Met?*
Room B5 – Boiler room	23.1	30	NO
Room B4 – Storage	7.6	30	NO
Room B3 – Lounge	44.9	10	YES
Room B2A – Lounge	152.4	10	YES
Room B2 – Lounge	122.6	10	YES
Room B1 – Fitness room	110.4	30	YES
Room 103 – Office	16.3	50	NO
Room 104 – Storage	8.5	30	NO
Room 102 – Storage	5.9	30	NO
Room 105/106 – Kitchen	61.7	10	YES
Room 106A – Storage	108.0	30	YES
Room 109 – Storage	24.8	30	NO
Room 107 – Restroom	15.9	5	YES
Room 108 – Lounge	69.4	10	YES
Room 110 – Office	100.8	50	YES
Room 110A – Office	52.2	50	YES
Room 110B – Office	49.5	50	NO
Room 111 – Office	116.4	50	YES
Room 111A – Office	46.1	50	NO
Room 111B – Office	153.1	50	YES
Room 112 – Recruiter's office	61.4	50	YES
Room 112A – Recruiter's office	54.9	50	YES
Room 113 – Lobby	27.7	5	YES
Room 114 – Storage	5.9	30	NO
Room 115 – Restroom	35.1	5	YES
Room 116 – Classroom	130.9	30	YES

Army National Guard – Catonsville Readiness Center Lighting Survey			
Location	*Measurement in Foot Candles*	*Requirement in Foot Candles*	*Requirement Met?*
Room 117 – Storage	96.6	30	YES
Room 118A – Locker room	7.8	7	YES
Room 119 & 120 – Vaults	Inaccessible		
Room 118 – Restroom	12.8	5	YES
Room 122 – Storage	10.8	30	NO
Room 121 – Storage	29.7	30	NO
Room 123A – Storage	55.0	30	YES
Room 123 – Storage	18.1	30	NO
Room 124/124A – Storage	67.6	30	YES
Room 101 – Drill hall	28.4	30	NO

Lighting levels were compared to the levels outlined within the ANSI/IESNA RP-1-04 Office Lighting Handbook, and the ANSI/IESI RP-7-01 Lighting Industrial Facilities Handbook. Areas within the facility which did not meet the foot candle requirements are identified with a "NO" within the Requirement Met? column. It is recommended that illumination be improved in all the areas that did not meet the requirements. Improving illumination can be achieved by replacing burned-out lamps/bulbs, cleaning fixtures, relocating detailed work activities to more illuminated areas, and using supplemental task lighting.

5.0 - CONCLUSION

Bonus Environmental, LLC was contracted by the National Guard Bureau Region North to identify and measure the existence and extent of potentially hazardous operations or conditions at the Catonsville Army National Guard Readiness Center located at 130 Mellor Avenue in Catonsville, Maryland. The purpose of this evaluation was to generate or to update a previous baseline evaluation so that employee exposure history can be provided to each civilian and military employee. An industrial hygiene evaluation of the facility was performed by Bonus Environmental, LLC representative [redacted] on May 14, 2010.

Bonus Environmental, LLC recommends that any areas of concerns outlined within this report be evaluated to ensure the necessary actions are made. Following the completion of the industrial hygiene evaluation, Bonus Environmental, LLC found the following safety and/or indoor air quality conditions of the facility to be within acceptable levels/condition in regards to the following:

- Carbon Dioxide
- Carbon Monoxide
- Presumed Asbestos-Containing Materials
- Housekeeping
- Lead Air Samples
- Ergonomics
- Temperature
- Relative Humidity

It has been a pleasure to be of assistance to you. Please contact us if you have any questions concerning this report or if we can be of any further assistance in any other environmental or occupational health matter.

Sincerely,

Non-Responsive [redacted]

Principal
Bonus Environmental, LLC

Non-Responsive [redacted]

Principal
Bonus Environmental, LLC

Bonus Environmental, LLC ***P.O. Box 121*** ***Mt. Pleasant, MI 48804***
Work 989-779-7686 ***Fax 989-779-7689*** ***www.bonusenvironmental.com***

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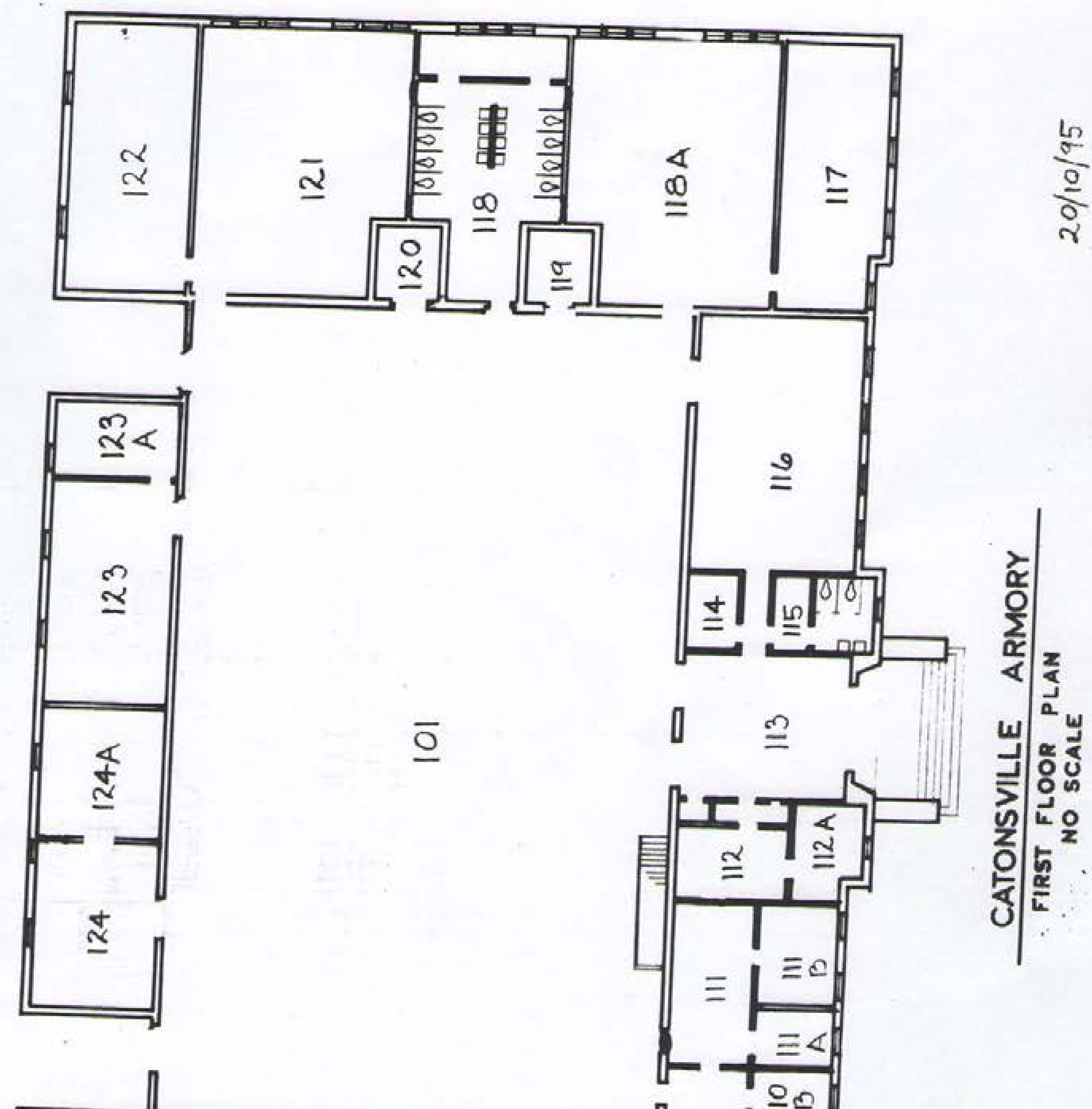
Appendix A

Shop Diagram


CATONSVILLE ARMORY
FIRST FLOOR PLAN
NO SCALE
20/10/95
101
102
103
104
105
106
106 A
107
108
109
110
110 A
110 B
111
111 A
111 B
112
112 A
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118A
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123 A
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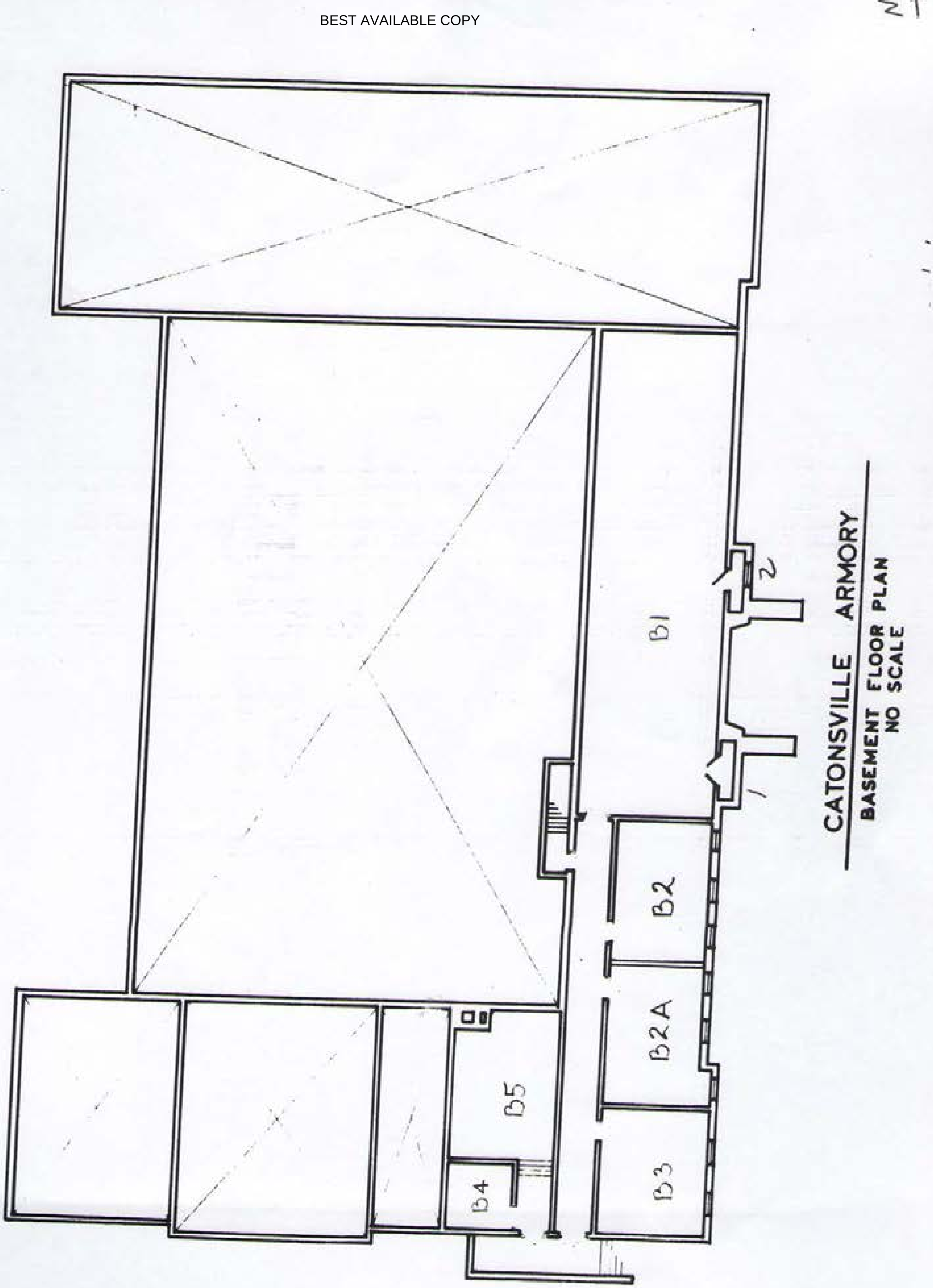
124A



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Appendix B

Lead Sample Results

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

RECEIVED JUN 14 2010

ACCREDITED LABORATORY AIHA Environmental Lead See aihalqap.org for details 100470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Catonsville Armory	**Chain Of Custody:**	507187
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Catonsville,MD	**Date Submitted:**	5/21/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Catonsville Armory	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	5/28/2010
Attention:	[redacted]			**Report Date:**	6/1/2010

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
1047824	CV-A-1	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1047825	CV-A-2	Flame	Air	810	N/A	3.7	ug/m³	<3	<3.7	ug/m³	
1047826	CV-A-3	Flame	Air	810	N/A	3.7	ug/m³	<3	<3.7	ug/m³	
1047827	CV-W-1	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
1047828	CV-W-2	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047829	CV-W-3	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047830	CV-W-4	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047831	CV-W-5	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047832	CV-W-6	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047833	CV-W-7	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047834	CV-W-8	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047835	CV-W-9	Flame	Wipe	****	0.111	110	ug/ft²	1200	10000	ug/ft²	
1047836	CV-W-10	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047837	CV-W-11	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047838	CV-W-12	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047839	CV-W-13	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047840	CV-W-14	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047841	CV-W-15	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047842	CV-W-16	Flame	Wipe	****	0.111	110	ug/ft²	15	140	ug/ft²	

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCREDITED LABORATORY AIHA Environmental Lead See aihaqap.org for details 100470

NY ELAP 10920

Client: National Guard Bureau
Address: 301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation
Havre de Grace, Maryland 21078
Attention: [redacted]

Job Name: Catonsville Armory
Job Location: Catonsville,MD
Job Number: Catonsville Armory
P.O. Number: W912K6-09-A-0003

Chain Of Custody: 507187
Date Submitted: 5/21/2010
Person Submitting: [redacted]
Date Analyzed: 5/28/2010 **Report Date:** 6/1/2010

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Total ug	Final Result	Comments
1047843	CV-W-17	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047844	CV-W-18	Flame	Wipe	****	0.111	110 ug/ft²	62	560 ug/ft²	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results
Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accreditation applies only to paint chip, wipe, and soil samples.

Analyst: Nida McGarvey

Technical Manager: G Edward Carney

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AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 19394

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	5/28/2010

	Result		Percent Recovery	RPD	Comment
Preparation Blank	0.037	ppm			Acceptable
Report Limit Verification Sample	0.317	ppm	95.1%		Acceptable
Expected Spike Level (ppm) 0.3333					
Duplicate Sample 1		mg/Kg			
Duplicate Sample 2		mg/Kg			Acceptable
Matrix Spike Analysis					
Spiked Sample					Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample 1	259.328	µg	103.33%		Acceptable
Laboratory Control Sample 2	222.761	µg	102.94%	0.38%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999698

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507188	47799	FR-W-21
507186	47823	JI-W-21

SDG Number: 19394

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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507187	47827	CV-W-1
507187	47828	CV-W-2
507187	47829	CV-W-3
507187	47830	CV-W-4
507187	47831	CV-W-5
507187	47832	CV-W-6
507187	47833	CV-W-7
507187	47834	CV-W-8
507187	47835	CV-W-9
507187	47836	CV-W-10
507187	47837	CV-W-11
507187	47838	CV-W-12
507187	47839	CV-W-13
507187	47840	CV-W-14
507187	47841	CV-W-15
507187	47842	CV-W-16
507187	47843	CV-W-17
507187	47844	CV-W-18

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AMA Analytical Services, Inc.

Focused on Results!!

NVLAP 101143-0
NY ELAP 10920
AIHA Accredited Laboratory — Environmental Lead & Industrial Hygiene; AIHA Accredited Laboratory — Environmental Microbiology
100470

Submitting Samples for National Guard Jobs

1) All samples shall be submitted to AMA Analytical Services, Attn: Sample Receiving, utilizing the enclosed Chain-of-Custody Form. The highlighted areas must be completed by the Subcontractor, however, the Sample Information/Analysis/Matrix section will not need to be completed if field date sheets are submitted with the samples. Please be sure to include a contact phone number for the person submitting the samples.
2) Results shall be reported via email to the following persons:
   a. National Guard Subcontractor: Non-Responsive [redacted] @bonusenvironmental.com
   b. Non-Responsive [redacted] CIV NGB: Non-Responsive [redacted] @us.army.mil
   c. [redacted] CIV NGB [redacted] .army.mil
3) Hard Copy Reports & Invoices shall be handled in the following manner:
   a. Original Invoices and Copies of Reports shall be sent to the National Guard
      National Guard Bureau
      Attn: Non-Responsive [redacted]
      301-IH Old Bay Lane
      Attn: NGB-AVN-SI, State Military Reservation
      Havre de Grace, Maryland 21078
   b. Original Reports shall be sent the National Guard Subcontractor

      Attn: Non-Responsive [redacted]
      office: 989-779-7686
      cell: 989-621-3862

4) All Pb Wipes shall be handled in the following manner:
   a. All samples shall be analyzed utilizing FLAA procedures
   b. Samples whose results are reported as less than the reporting limit, and the reporting limit is greater than 40ug/ft2 shall be re-analyzed utilizing GFAA procedures.
5) All other samples – Pb Paints, Soils, & Airs, PCM Airs, PLM Bulks, TEM Airs, & TEM Bulks shall be analyzed utilizing standard analytical procedures

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

OWI (410) 247-2024

159202

210 REV. 6.08

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

Sheet 1 of 2

507187

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Catonsville Armory
2. Job Location: Catonsville, MD
3. Job #: Catonsville Armory
4. Contact Perso[redacted] PO #: W912K6-09-A-0003
5. Submitted By[redacted] @ phone # (410) 942-0273

[redacted]nature:

AFTER HOURS (must be pre-scheduled)
❑ Immediate Date Due: ______
❑ 24 Hours Time Due: ______
Comments: ______

Reporting Information (Results will be provided as soon as technically feasible):

NORMAL BUSINESS HOURS
❑ Immediate
❑ Next Day
❑ 2 Day
❑ 3 Day
☒ 5 Day +
Date Due: 5-28-10
❑ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Inclu[redacted]th Report
☒ [redacted] bonusenvironmental.com
❑ Fax: [redacted] us.army.mil
❑ Verb[redacted] us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
❑ NIOSH 7400 ______ (QTY)
❑ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
❑ AHERA ______ (QTY)
❑ NIOSH 7402 ______ (QTY)
❑ Other (specify ______) ______ (QTY)
PLM Bulk
❑ EPA 600 – Visual Estimate ______ (QTY)
❑ EPA Point Count ______ (QTY)
❑ NY State Friable 198.1 ______ (QTY)
❑ Grav. Reduction ELAP 198.6 ______ (QTY)
❑ Other (specify ______) ______ (QTY)
MISC
❑ Vermiculite
❑ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
❑ ELAP 198.4/Chatfield ______ (QTY)
❑ NY State PLM/TEM ______ (QTY)
❑ Residual Ash ______ (QTY)
TEM Dust
❑ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
❑ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
❑ Quan. (s/area)Dust D6480-99 ______ (QTY)
TEM Water
❑ Qual. (pres/abs) ______ (QTY)
❑ ELAP 198.2/EPA 100.2 ______ (QTY)
❑ EPA 100.1 ______ (QTY)

☑ All samples received in good condition unless otherwise noted.
(TEM Water samples ______ °C)

Metals Analysis
❑ Pb Paint Chip ______ (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 18 (QTY)
☒ Pb Air 3 (QTY)
❑ Pb Soil/Solid ______ (QTY)
❑ Pb TCLP ______ (QTY)
❑ Drinking Water ❑ Pb____(QTY) ❑ Cu____(QTY) ❑ As____(QTY)
❑ Waste Water ❑ Pb____(QTY) ❑ Cu____(QTY) ❑ As____(QTY)
❑ Pb Furnace (Media ______) ______ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
❑ Spore-Trap ______ (QTY)
❑ Surface Swab ______ (QTY)
❑ Surface Tape ______ (QTY)
❑ Other (Specify ______) ______ (QTY)
❑ Surface Vacuum Dust ______ (QTY)
❑ Culturable ID Genus (Media ______) ______ (QTY)
❑ Culturable ID Species (Media ______) ______ (QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
CV-A-1	Field Blank	5-14	0	—				X		X						
CV-A-2	Drill Hall		810	—				X		X						
CV-A-3	Rm B1		810	—				X		X						
CV-W-1	Field Blank		—	—				X				X				
CV-W-2	Drill Hall		—	4"x4"				X				X				
CV-W-3	Drill Hall		—					X				X				
CV-W-4	Drill Hall		—					X				X				
CV-W-5	Drill Hall		—					X				X				
CV-W-6	Drill Hall		—					X				X				
CV-W-7	Kitchen		—					X				X				
CV-W-8	Rm B3		—					X				X				
CV-W-9	Rm B1		—					X				X				

CLIENT CONTACT
(LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 5 / 21 / 10 @ 9:45 Via: FedEx By (Print): Surit Watson Sign: [signature]
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ______ Sign: ______
3. Results Reported To: ______
4. Comments: ______ Via: MM Date: 6 / 1 / 10 Time: 19 05 Initials: NM

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AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

OWI (410) 247-2024 159202 210 REV. 6.08

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) Sheet 2 of 2 **507187**

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Catonsville Armory
2. Job Location: Catonsville, MD
3. Job #: Catonsville Armory
4. Contact Perso[redacted] P.O. #: W912K6-09-A-0003
5. Submitted by: [redacted] @ phone # [redacted] ...nature: [redacted]

AFTER HOURS (must be pre-scheduled)
❑ Immediate Date Due:
❑ 24 Hours Time Due:
Comments:

Reporting Information (Results will be provided [redacted] **as technically feasible):**

NORMAL BUSINESS HOURS
❑ Immediate ❑ 3 Day
❑ Next Day ☒ 5 Day +
❑ 2 Day Date Due:
❑ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
[redacted] ...ith Report
bcu/senvironmental.com
us.army.mil
us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
❑ NIOSH 7400 ____ (QTY)
❑ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
❑ AHERA ____ (QTY)
❑ NIOSH 7402 ____ (QTY)
❑ Other (specify ____) ____ (QTY)
PLM Bulk
❑ EPA 600 – Visual Estimate ____ (QTY)
❑ EPA Point Count ____ (QTY)
❑ NY State Friable 198.1 ____ (QTY)
❑ Grav. Reduction ELAP 198.6 ____ (QTY)
❑ Other (specify ____) ____ (QTY)
MISC
❑ Vermiculite
❑ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
❑ ELAP 198.4/Chatfield ____ (QTY)
❑ NY State PLM/TEM ____ (QTY)
❑ Residual Ash ____ (QTY)
TEM Dust
❑ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
❑ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
❑ Quan. (s/area)Dust D6480-99 ____ (QTY)
TEM Water
❑ Qual. (pres/abs) ____ (QTY)
❑ ELAP 198.2/EPA 100.2 ____ (QTY)
❑ EPA 100.1 ____ (QTY)

❑ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
❑ Pb Paint Chip ____ (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 18 (QTY)
☒ Pb Air 3 (QTY)
❑ Pb Soil/Solid ____ (QTY)
❑ Pb TCLP ____ (QTY)
❑ Drinking Water ❑ Pb ____ (QTY) ❑ Cu ____ (QTY) ❑ As ____ (QTY)
❑ Waste Water ❑ Pb ____ (QTY) ❑ Cu ____ (QTY) ❑ As ____ (QTY)
❑ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
❑ Spore-Trap ____ (QTY) ❑ Surface Vacuum Dust ____ (QTY)
❑ Surface Swab ____ (QTY) ❑ Culturable ID Genus (Media ____) ____ (QTY)
❑ Surface Tape ____ (QTY) ❑ Culturable ID Species (Media ____) ____ (QTY)
❑ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
CV-W-10	Rm B1	5-14	—	4"x4"												
CV-W-11	Rm B1		—					✗				✗				
CV-W-12	Rm B1		—					✗				✗				
CV-W-13	Basement Hallway		—					✗				✗				
CV-W-14	Rm 108		—					✗				✗				
CV-W-15	Rm 113		—					✗				✗				
CV-W-16	Rm 118 A		—					✗				✗				
CV-W-17	Rm 121		—					✗				✗				
CV-W-18	Rm 102		—					✗				✗				
			—					✗				✗				

CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: ____ / ____ / ____ @ ____ Via: ____ By (Print) ____ Sign: ____
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print) ____ Sign: ____
3. Results Reported To: ____ Sign: ____
4. Comments: ____ Via: ____ Date: ____ / ____ / ____ Time: ____ Initials: ____

Appendix C

Photographs

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Building exterior, east side entrance


Rm. B1, current fitness room, former indoor firing range


Drill Hall


Rm. 104 Storage of chemicals

Rm. 102, PPE board


Building exterior, SW of building


Boiler room

Rm. 102, flammable cabinet


Inside of P.O.L. building


Exterior of P.O.L. building

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Appendix D

References

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1. Department of Defense Instruction (0001) 6055.1, Department of Defense Occupational Safety and Health (OS H) Program, August 19, 1998.

2. Army Regulation (AR) 11-34, The Army Respiratory Protection Program, February 15, 1990.

3. DA PAM 40-503, Medical Service, Industrial Hygiene Program, October 30, 2000.

4. Technical Manual (T.M) 5-810-1, Mechanical Design, Heating, Ventilation, and Air Conditioning, June 1991.

5. Threshold Limit Values (TLVs) and Biological Exposure Indices (BEls), American Conference of Governmental Industrial Hygienists (ACGIH), current edition.

6. Industrial Ventilation - A Manual of Recommended Practices, American Conference of Governmental Industrial Hygienists (ACGIH), current edition.

7. UFC 3-410-01 FA Heating, Ventilating, and Air Conditioning, 15 May 2003

8. Occupational Safety and Health Administration (OSHA) Lead in Construction Standard, 29 CFR 1926.62

9. OSHA Lead Standard 29 CFR 1910.1025

10. OSHA Respiratory Protection Standard 29 CFR 1910.134

11. Army Regulation (AR) 385-10, The Army Safety Program, August 23, 2007.

12. RP-1-2004, Office Lighting, Illuminating Engineering Society of North America (IESNA)/ANSI.

13. RP-7-2001, Industrial Lighting, (IESNA)/ANSI.

14. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Standard 62.1-2007, "Ventilation for Acceptable Indoor Air Quality".

15. ASHRAE Standard 55-2004 – "Thermal Environmental Conditions for Human Occupancy"

16. Title 24, CFR, Part 35, Subpart B, Sections 35.110, Definitions of Lead-Based Paint, Housing and Urban Development, U.S. Department of Housing.

17. OSHA Personal Protective Equipment 29 CFR 1910.132

18. OSHA Permissible Exposure Limit (PEL) for General Industry 29 CFR 1910.1000 Z-1 Table

19. Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Department of Health and Mental Hygiene, November 2008.

20. Mold Remediation in Schools and Commercial Buildings, U.S. Environmental Protection Agency, March 2001

21. Army Facilities Management Information Document on Mold Remediation Issues TG277, February 2002

22. OSHA Welding, Cutting, Brazing 29 CFR 1910.252

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COMPLIANCE MANAGEMENT INTERNATIONAL

1215 Manor Drive, Suite 205
Mechanicsburg, PA 17055
Phone: 717.590.7031
Fax: 717.590.7936
www.complianceplace.com

Industrial Hygiene Survey Report

National Guard Facility
Catonsville Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Catonsville Readiness Center** **130 Mellor Avenue** **Catonsville, MD 21228**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**July 26, 2013**
Report Date:	**September 3, 2013**

Non-Responsive [redacted]

Senior Industrial Hygienist

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Table of Contents

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on July 26, 2013, at the Catonsville Readiness Center located at 130 Mellor Avenue, Catonsville, MD 21228. The survey was performed by Mr. [redacted].

1. Lead surface and air samples were collected. Two sample results were above recommended guidelines and/or regulator standards and lead was detected in a third sample. See Section 3.0 for detailed sampling results.

2. Lighting levels did not meet the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in one location measured. See Section 4.0 for detailed findings.

3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.

    a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in all areas sampled.

    b. The relative humidity levels exceeded the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in two locations.

    c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 parts per million (ppm).

    d. Carbon dioxide (CO_2) levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings.

    See Section 5.0 for detailed sampling results.

4. Suspect asbestos containing materials (ACM) floor tile and black mastic was observed to be intact and in good condition.

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Section 2.0 Operation Description & Observations

The Catonsville Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, and a converted firing range area (currently the weight room). There were approximately 3 full-time employees stationed at this facility at the time of this survey. There are no maintenance personnel assigned to the building.

The 25,900 square foot building is reported to have been built in 1952. It is a single story structure with a basement. The exterior is brick and block. The interior walls are block, wood paneling, plaster and drywall. The floors are concrete, wood, 9"X9" and 12"x12" floor tiles.

The heating system is oil forced hot water unit. There are window air conditioners present in the facility.

Room 122 NBC storage room has a significant fungal growth problem. There is visible fungal growth on the ceiling and contents in this room total more than 100 square feet of fungal growth. A strong fungal odor is present. It was reported that there is a roof leak in the caged storage area in this room. Relative humidity in this room was 79.8%.

There is an attached garage at this facility however no over head vehicle exhaust system is present. It was reported that no vehicle maintenance is preformed at this facility. One vehicle was parked in the garage at the time of the survey.

There is no child-care facility in the building.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared to be properly designed. Personnel had supportive chairs.

This facility has a converted firing range (CFR) that is now used as a weight room.

Suspect asbestos containing material (ACM) 9"X9" floor tile and black mastic was observed to be intact and in good condition.

No chipped or peeling paint were observed.

Housekeeping is adequate.

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Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 micrometer (um) mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2
1	Drill Hall	<17	*
2	Converted Firing Range/Weight Room	<17	*
3	Drill Hall – Floor	*	<110
4	Drill Hall – Top of Coke Machine	*	<110
5	Drill Hall – Top of Wall Locker	*	<110
6	Kitchen – Top of Wall Locker	*	<110
7	Kitchen – Top of Metal Table	*	<110
8	Hallway – Floor Outside of Converted Firing Range/Weight Room	*	<110
9	Converted Firing Range/Gym - Floor	*	<110
10	**Converted Firing Range/Gym – Top of Light Fixture**	*	**1500**
11	Converted Firing Range/Gym – Top of Table	*	150
12	**Garage – Top of Electrical Panel**	*	**390**
13	Office 116 – Top of Desk	*	<110
14	Office 111 – Top of Wall Locker	*	<110
15	Room 108 – Top of Book Shelf	*	<110
16	Office B-02 – Top of Wall Locker	*	<110
17	Office B-03 – Top of Desk	*	<110
18	Blank - Wipe	*	<12
19	Blank - Air	<3	*
-	**Criteria**	**50**	**200**

Table Notes:
1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2** = micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Sources:

1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges
2. OSHA 29CFR1910.1025 Lead Standard

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 “Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges” as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Lead surface and air samples were collected. The following is a summary of the sample results from this survey.

- Two of the sample locations exceed the recommended limit of 200 ug/ft^2. Lead was also found at one other sample location. Cleaning procedures should be improved to maintain lead levels on surfaces below the analytical detection limit.

- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m^3).

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Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98082EL). The light meter was last calibrated in April 2013. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
NBC Storage Room 122	54.1	30	Yes
Office 116	92.5	30-50	Yes
Attached Garage	**43.2**	**75**	**NO**
Room 121 Wall Locker Storage	37.2	10	Yes
Room 118-A Wall Locker Storage	35.1	10	Yes
Room 117 Supply Room	68.1	30	Yes
Office 111	88.9	30-50	Yes
Office 111-A	95.4	30-50	Yes
Office 110	106.1	30-50	Yes
Classroom 108	92.3	30-50	Yes
Kitchen	222.3	50	Yes
Converted Firing Range/Gym	145.8	30	Yes
Office B-02	101.3	30-50	Yes
Office B-03	70.1	30-50	Yes

Table Notes:

1. FC = Foot Candles
2. **Bolded** results did not meet listed criteria

Source: ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

The lighting levels did not meet the minimum recommended guideline in the garage.

Section 5.0 Indoor Air Quality

Survey measurements were made for comfort parameters and ventilation (temperature, relative humidity, carbon dioxide, and carbon monoxide). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7575-X (Serial #1228008). The IAQ Meter was last calibrated in July 2012.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2010). ASHRAE specifies temperature ranges for human comfort (ASHRAE 55-2010). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60%.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	84.5	45.6	360	0.0
Room 122 NBC Storage	74.3	**79.8**	682	0.0
Room 116	72.7	56.0	417	0.0
Attached Garage	75.0	**61.0**	360	0.0
Criteria	**68-79**	**30-60**	**<1,060**	**<9**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **°F =** degrees Fahrenheit

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements met the recommended 68-79°F in all sampled areas.
- Relative humidity levels exceeded the recommended guideline of 30 – 60 % in room 122 NBC storage area and the attached garage.
- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is

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obtained by adding 700 ppm to the measured outdoor carbon dioxide level. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,060 ppm (700 ppm + 360 ppm). This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide

- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. The following observation were noted:

1. Room 122 NBC storage room has a significant fugal growth problem. There is visible fungal growth on the ceiling and contents in this room > 100 square feet. A strong fungal odor is present. It was reported that there is a roof leak in the caged storage area in this room. Relative humidity in this room was 79.8%.

Section 6.0 Suspect Asbestos Containing Building Materials (ACM)

Suspect (ACM) (asbestos containing material) was noted at the time of this survey:

9”X9” floor tile and black mastic was observed to be intact and in good condition. Exposed black mastic should be covered over.

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

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Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98002EL	4/2013	NA
SKC Air Sampling Pump	LVP06	7/26/13	2.50 LPM
SKC Air Sampling Pump	767926	7/26/13	2.50 LPM

Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

Appendix A. Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #100470

Client:	National Guard Bureau	**Job Name:**	ARNG-MD	**Chain Of Custody:**	516446
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Catonsville-RC	**Date Submitted:**	7/29/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted] Non-Responsive
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	7/30/2013 **Report Date:** 7/31/2013

Attention: [redacted] Non-Responsive

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
13080956	1	Flame	Air	180	N/A	17	ug/m³	<3	<17	ug/m³	
13080957	2	Flame	Air	180	N/A	17	ug/m³	<3	<17	ug/m³	
13080958	3	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080959	4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080960	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080961	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080962	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080963	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080964	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080965	10	Flame	Wipe	****	0.108	110	ug/ft²	160	1500	ug/ft²	
13080966	11	Flame	Wipe	****	0.108	110	ug/ft²	16	150	ug/ft²	
13080967	12	Flame	Wipe	****	0.108	110	ug/ft²	42	390	ug/ft²	
13080968	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080969	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080970	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080971	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080972	17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080973	18	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13080974	19	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #100470

Client:	National Guard Bureau	**Job Name:**	ARNG-MD	**Chain Of Custody:**	516446		
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Catonsville-RC	**Date Submitted:**	7/29/2013		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	7/30/2013	**Report Date:**	7/31/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Total ug	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)

%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: Nida McGarvey / Kim Shipe **Technical Manager:** G Edward Carney

OWI (410) 247-2024 159202 210 REV. 6.08

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **516446**

Mailing/Billing Information:

1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:

1. Job Name: ARNG-MD
2. Job Location: Catonsville - RC
3. Job #: [redacted] P.O. #: W912K6-09-A-0003
4. Contact Pers[redacted] @ phone # (410) 942-0273
5. Submitted b[redacted]gnature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ____ ☐ 24 Hours Time Due: ____ Comments: ____	☐ Immediate ☐ 3 Day ☐ Next Day ☒ 5 Day + ☐ 2 Day Date Due: 8/5/13 ☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)	☒ [redacted]with Report ☒ [redacted] compliance place.com ☐ [redacted]@us.army.mil ☐ [redacted]@us.army.mil

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
- ☐ NIOSH 7400____(QTY)
- ☐ Fiberglass____(QTY)

TEM Air – Please Indicate Filter Type:
- ☐ AHERA____(QTY)
- ☐ NIOSH 7402____(QTY)
- ☐ Other (specify____)____(QTY)

PLM Bulk
- ☐ EPA 600 – Visual Estimate____(QTY)
- ☐ EPA Point Count____(QTY)
- ☐ NY State Friable 198.1____(QTY)
- ☐ Grav. Reduction ELAP 198.6____(QTY)
- ☐ Other (specify____)____(QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
- ☐ ELAP 198.4/Chatfield____(QTY)
- ☐ NY State PLM/TEM____(QTY)
- ☐ Residual Ash____(QTY)

TEM Dust
- ☐ Qual. (pres/abs) Vacuum/Dust____(QTY)
- ☐ Quan. (s/area) Vacuum D5755-95____(QTY)
- ☐ Quan. (s/area)Dust D6480-99____(QTY)

TEM Water
- ☐ Qual. (pres/abs)____(QTY)
- ☐ ELAP 198.2/EPA 100.2____(QTY)
- ☐ EPA 100.1____(QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____°C)

Metals Analysis
- ☐ Pb Paint Chip____(QTY)
- ☒ Pb Dust Wipe (wipe type Ghost) ~~17~~ 16 (QTY)
- ☒ Pb Air ~~2~~ 3 (QTY)
- ☐ Pb Soil/Solid____(QTY)
- ☐ Pb TCLP____(QTY)
- ☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Pb Furnace (Media____)____(QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples:____
Collection Media____
- ☐ Spore-Trap____(QTY) ☐ Surface Vacuum Dust____(QTY)
- ☐ Surface Swab____(QTY) ☐ Culturable ID Genus (Media____)____(QTY)
- ☐ Surface Tape____(QTY) ☐ Culturable ID Species (Media____)____(QTY)
- ☐ Other (Specify____)____(QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1 Drill Hall		7.26	180					X		X						
2 Range			180					X		X						
3 Drill Hall - floor				100 cm²				X				X				
4 Drill Hall - Coke machine								X				X				
5 Drill Hall wall locker								X				X				
6 Kitchen - wall locker								X				X				
7 Kitchen · metal table								X				X				
8 Hall floor outside Range								X				X				
9 Range · floor								X				X				
10 Range · light fixture								X				X				
11 Range · Table								X				X				
12 Garage · Elec. Panel												X				

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time: Contact: By:

Date/Time: Contact: By:

Date/Time: Contact: By:

LABORATORY STAFF ONLY (CUSTODY)

1. Date/Time RCVD: 7 / 29 / 13 @ 0900 Via: FedEx By (Print): [signature] Sign: [signature]
2. Date/Time Analyzed: ____/____/____ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ____/____/____ Time: ____ Initials: ____
4. Comments: 3995 2491 4380

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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 516446 (page 2 of 2)

2 of 2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: ARNG. MD
2. Job Location: Catonsville - RC
3. Job #: [redacted] #: W912K6-09-A-0003
4. Contact Per[redacted] @ ph[redacted]273
5. Submitted b[redacted]gnature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ______ ☐ 24 Hours Time Due: ______ Comments: ______	☐ Immediate ☐ 3 Day ☐ Next Day ☐ 5 Day + ☐ 2 Day Date Due: ______ ☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)	☒ Incl[redacted]ith Report ☒ Em[redacted] Compliance place.co- ☐ Fax[redacted]us.army.mil ☐ Ver[redacted]us.army.mil

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
- ☐ NIOSH 7400 ______(QTY)
- ☐ Fiberglass ______(QTY)

TEM Air – Please Indicate Filter Type:
- ☐ AHERA ______(QTY)
- ☐ NIOSH 7402 ______(QTY)
- ☐ Other (specify ______) ______(QTY)

PLM Bulk
- ☐ EPA 600 – Visual Estimate ______(QTY)
- ☐ EPA Point Count ______(QTY)
- ☐ NY State Friable 198.1 ______(QTY)
- ☐ Grav. Reduction ELAP 198.6 ______(QTY)
- ☐ Other (specify ______) ______(QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
- ☐ ELAP 198.4/Chatfield ______(QTY)
- ☐ NY State PLM/TEM ______(QTY)
- ☐ Residual Ash ______(QTY)

TEM Dust
- ☐ Qual. (pres/abs) Vacuum/Dust ______(QTY)
- ☐ Quan. (s/area) Vacuum D5755-95 ______(QTY)
- ☐ Quan. (s/area)Dust D6480-99 ______(QTY)

TEM Water
- ☐ Qual. (pres/abs) ______(QTY)
- ☐ ELAP 198.2/EPA 100.2 ______(QTY)
- ☐ EPA 100.1 ______(QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ______°C)

Metals Analysis
- ☐ Pb Paint Chip ______(QTY)
- ☒ Pb Dust Wipe (wipe type Ghost) 17 (QTY)
- ☒ Pb Air 3 (QTY)
- ☐ Pb Soil/Solid ______(QTY)
- ☐ Pb TCLP ______(QTY)
- ☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Pb Furnace (Media ______) ______(QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
- ☐ Spore-Trap ______(QTY) ☐ Surface Vacuum Dust ______(QTY)
- ☐ Surface Swab ______(QTY) ☐ Culturable ID Genus (Media ____) ____(QTY)
- ☐ Surface Tape ______(QTY) ☐ Culturable ID Species (Media ____) ____(QTY)
- ☐ Other (Specify ____) ____(QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13 Office 116 -	Desk	7-22		100 in²				X				X				
14 Office 111 -	locker							X				X				
15 Room 105 -	Book Shelf							X				X				
16 Office B-02	locker							X				X				
17 Office B-03	Desk							X				X				
18 Blank				0				X				X				
19 Blank			0					X		X						

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time: Contact: By:

Date/Time: Contact: By:

Date/Time: Contact: By:

LABORATORY STATE OF (CUSTODY)

1. Date/Time RCVD: ____/____/____ @____ Via: ______ By (Print): ______ Sign: ______
2. Date/Time Analyzed: ____/____/____ @____ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ____/____/____ Time: ____ Initials: ____
4. Comments: ______

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Appendix B. Photographs

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Exterior of facility

Drill Hall

Garage area

PPE station

N95 Respirator

Right-to-know station

Spill station

Room 122 visible fungal growth on ceiling this room has a strong mold odor

Converted firing range/weight room

Suspect asbestos floor tile in good condition

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Appendix C. Floor Plan

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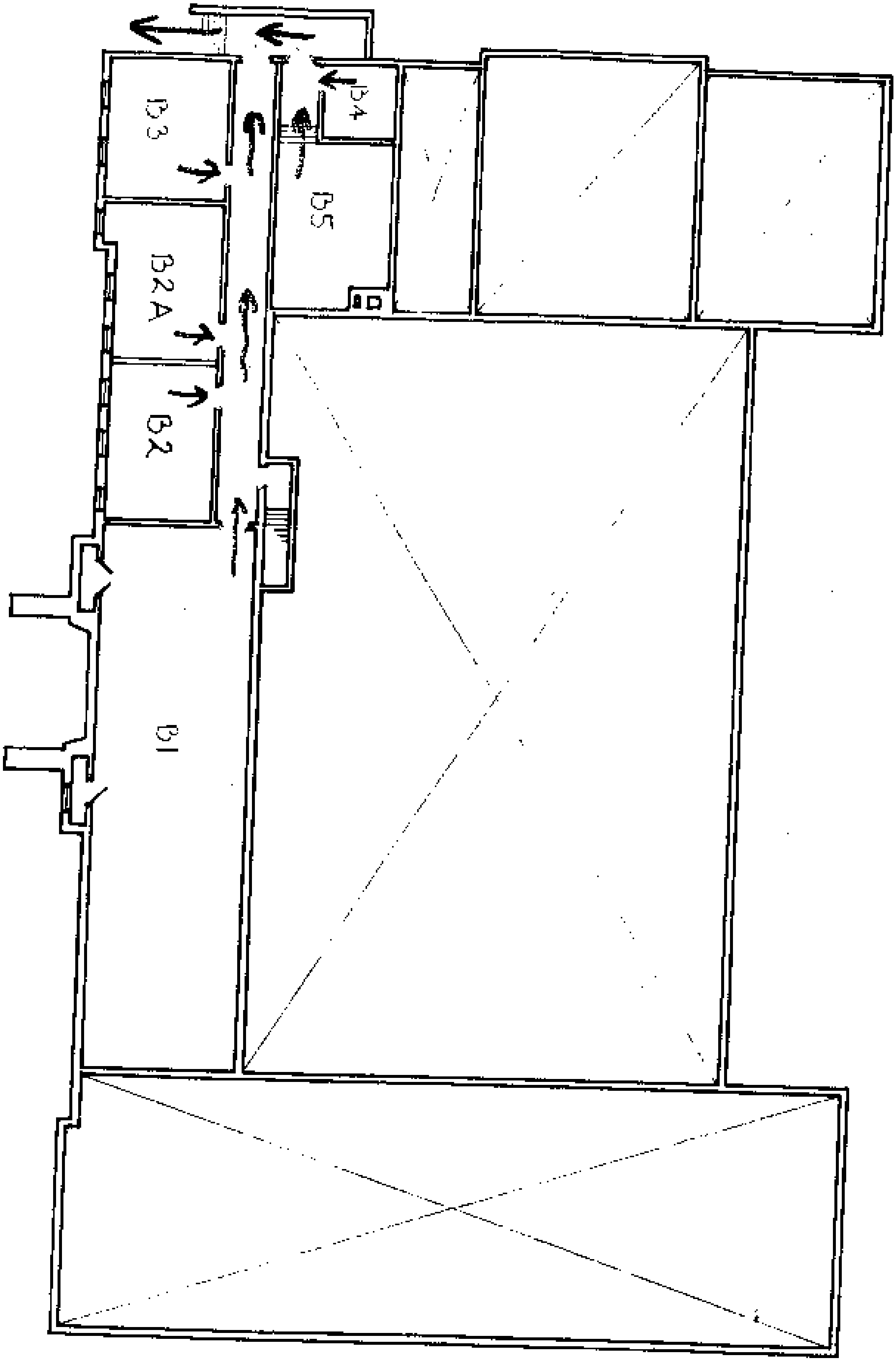
EVACUATION PLAN



CATONSVILLE ARMORY
BASEMENT FLOOR PLAN
NO SCALE

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Appendix D. References

1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead.

2. American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2011 Edition.

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition.

4. American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2010.

5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.

6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.

7. National Emission Standard Hazardous Air Pollutants (NESHAP) – The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

8. National Ambient Air Quality Standards (NAAQS) - National primary ambient air quality standards for carbon monoxide 40 CFR 50.8.

9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227 (h) (3)].

10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM).

11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.

12. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.

13. ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

MAY 11 2007

MEMORANDUM FOR National Guard Bureau Region North Industrial Hygiene Office (NGB-ARS-IHNE/Ms. [redacted]), 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities, Industrial Hygiene Baseline Survey, Congressman Steny Hoyer Armory & Field Maintenance Shop #8A, Cheltenham, MD, Report No. 55-ML-01ED-03/07, 21 August and 30 September 2003

1. Enclosed is the final copy of the subject report and two CD-ROMs.

2. Our point of contact is Ms. [redacted] at commercial (410) 436-5475/3118, DSN 584-5475/3118, or electronic mail: [redacted]@us.army.mil.

FOR THE COMMANDER:

[redacted]

Encl

Director, Occupational Health Sciences

CF: (wo/CD-ROMs)
USACHPPM-NORTH (MCHB-AN-IH/MR. [redacted])

Readiness thru Health

U.S. Army Center for Health Promotion and Preventive Medicine

MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEY
REPORT NO. 55-ML-01ED-03/07
CONGRESSMAN STENY HOYER ARMORY &
FIELD MAINTENANCE SHOP #8A
CHELTENHAM, MD
21 AUGUST & 30 SEPTEMBER 2003

Distribution limited to U.S. Government agencies only. Requests for this document must be referred to the National Guard Bureau Region North Industrial Hygiene Office (NGB-ARS-IHNE/ Ms. [redacted]), 301-IH Old Bay Lane, Havre de Grace, MD 21078

CHPPM FORM 433-E (MCHB-CS-IPD), OCT 03

Readiness Thru Health

DESTRUCTION NOTICE - Destroy by any method that will prevent disclosure of contents or reconstruction of the document.

U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed $3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- ♦ *Integrity is the foundation*
- ♦ *Excellence is the standard*
- ♦ *Customer satisfaction is the focus*
- ♦ *Its people are the most valued resource*
- ♦ *Continuous quality improvement is its pathway*

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

CHPPM FORM 433-E (MCHB-CS-IPD), OCT 03 *(reverse)*

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEY
REPORT NO. 55-ML-01ED-03/07
CONGRESSMAN STENY HOYER ARMORY &
FIELD MAINTENANCE SHOP #8A
CHELTENHAM, MD
21 AUGUST & 30 SEPTEMBER 2003

1. PURPOSE OF EVALUATION. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) Congressman Steny Hoyer Armory and Field Maintenance Shop (FMS) #8A, Cheltenham, MD, to identify and measure the existence and extent of potentially hazardous operations or conditions at MDARNG facilities. The survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee.

2. CONCLUSIONS.

a. Lead Hazards. The former IFR (indoor firing rang) had been used but not completely decontaminated. Very high levels of lead in surface dust were found inside an enclosure around the bullet trap. These could lead to an inadvertent spread of lead contamination to other parts of the Armory.

b. Occupational Safety and Health Programs. Written Hazard Communication and Hearing Conservation Programs should be provided and implemented. Records of training, audiograms and other activities must be maintained.

c. Ventilation Deficiencies. The rooftop heating and ventilation units serving both buildings were unreliable. The washroom fan in the FMS #8A was not operating. The Vehicle Bay had severe air stratification in cold weather. The vehicle tailpipe and Battery Room exhaust systems had inadequate airflows, and the fan for the former was excessively noisy. One tailpipe hose was torn.

d. Other Deficiencies. The FMS #8A Vehicle Bay and Tool Crib desktop were inadequately lit. There were two active rain leaks in the FMS #8A. Ergonomic and noise hazards needed to be evaluated and mitigated. The CO (carbon monoxide) monitor in the Vehicle Bay was broken.

Readiness thru Health

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EXSUM, MDARNG IH Baseline Survey, Congressman Steny Hoyer Armory & FMS #8A, Cheltenham, MD, Report No. 55-ML-01ED-03/07, 21 August & 30 September 2003

3. RECOMMENDATIONS.

a. Lead Exposure. Health RAC (Risk Assessment Codes) 4.

(1) Restrict access to the bullet trap enclosure in the former IFR by keeping it locked. Post a sign warning against use of the enclosure for entry except in an emergency, or for storing of any material.

(2) If the enclosure area is renovated, clean all surfaces to the maximum level recommended by the National Guard Bureau Region North Industrial Hygiene Office and United States Army Center for Health Promotion and Preventive Medicine. Comprehensive guidelines are in Appendix E. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. Apply a sealant to the area after decontaminating the enclosure.

b. Occupational Safety and Health Programs. Health RAC 4. Develop and implement written Hazard Communication and Hearing Conservation Programs. Maintain records of training, audiograms, and other activities.

c. General Heating, Ventilating and Air Conditioning Systems. Health RAC 4. Investigate rooftop unit operating problems and repair or replace units as necessary. In FMS #8A Vehicle Bay 151, at minimum, install ceiling fans to reduce stratification. Investigate the potential replacement of the existing system by an infrared radiant system. Repair or replace the FMS #8A washroom fan.

d. Vehicle Tailpipe Exhaust System. Health RAC 3. Repair or disconnect the leaking hose. Modify or upgrade the system to provide at least 1,500 cubic feet per minute (cfm) per drop. One possibility is to reduce the number of connection points. Investigate the excessive fan noise and repair as needed.

e. Battery Room Exhaust System. Safety RAC 4. Adjust or replace the fan to provide at least 2 cfm per square foot of floor area.

f. Building Physical Condition. Health RAC 4. Repair the two active roof leaks in the FMS #8A and replace any damaged building materials.

g. Lighting. Health RAC 4. Provide additional task lighting in FMS #8A Vehicle Bay 151 and Tool Crib to meet illumination standards.

h. Noise Hazards. No RAC can be assigned. Assess noise hazards and implement control measures as appropriate.

i. Other Hazards. Safety RAC 3. Ensure that the CO monitor in FMS #8A Vehicle Bay 151 is repaired and calibrated.

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MDARNG IH Baseline Survey, Report No. 55-ML-01ED-03/07, Congressman Steny Hoyer Armory & FMS #8A, Cheltenham, MD, 21 August & 30 September 2003

CONTENTS

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INDUSTRIAL HYGIENE BASELINE SURVEY
REPORT NO. 55-ML-01ED-03/07
MARYLAND ARMY NATIONAL GUARD FACILITIES
CONGRESSMAN STENY HOYER ARMORY
FIELD MAINTENANCE SHOP (FMS) #8A
CHELTENHAM, MD
21 AUGUST AND 30 SEPTEMBER 2003

1. REFERENCES. See Appendix A.

2. PURPOSE. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) Congressman Steny Hoyer Armory and Field Maintenance Shop (FMS) #8A, Cheltenham, MD, to identify and measure the existence and extent of potentially hazardous operations or conditions at MDARNG facilities. The survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee.

3. AUTHORITY. E-mail, National Guard Bureau Region North Industrial Hygiene Office (NGB-ARS-IHNE/Ms. [redacted]), 28 February 2003, subject: SAB.

4. GENERAL.

a. Personnel Contacted. SSG [redacted], Environmental Compliance Assessment Coordinator for the MDARNG, 410-576-6132.

b. Survey Personnel. This survey was conducted on 21 August and 30 September 2003 by Mr. [redacted], Industrial Hygienist, United States Army Center for Health Promotion and Preventive Medicine (USACHPPM).

c. Risk Assessment Codes (RACs). The Department of Defense Instruction (DODI) 6055.1 provides a method for assigning RACs to health hazards that are based on the magnitude of exposures to physical, chemical, and biological agents and the possible medical effects. The DODI 6055.1 also provides RACs for safety and ergonomic hazards. A RAC is an expression of the risk associated with a hazard that combines the hazard severity and accident probability into a single numeral. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

d. Background. The Armory and FMS #8A were built in approximately 1995. Floor plans could not be located for this report. The facilities supported Company A, 129th Signal Battalion. The indoor firing range (IFR) had reportedly never been used for its intended purpose. The bullet trap and a short section of the floor in front of it had been enclosed by a partition accessible through a door from the main floor area. Nothing was observed to be stored inside this enclosure. The main floor area was reportedly used for storage, although a multiple-exercise weight machine was set up in the room.

Use of trademarked name(s) does not imply endorsement by the US Army but is intended only to assist in the identification of a specific product.

5. METHODOLOGY.

a. Assessment Criteria. Army Regulation 40-5 contains the requirement that airborne chemical exposures in Army facilities must comply with the lower of the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) or the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value®. The National Guard Bureau (NGB) criterion for lead in surface dust is discussed in Appendix B. The ACGIH provides criteria for industrial ventilation systems. The American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) publishes criteria for indoor air quality. The National Fire Protection Association National Fire Codes provides standards for fire and life safety. The Illumination Engineering Society – North America (IESNA) provides standards for minimum light levels.

b. Calibration. All instruments were calibrated in accordance with manufacturers' instructions using National Institute of Standards and Testing-traceable methods.

c. Methodology. The survey consisted of the collection of indoor air quality (IAQ) and ventilation measurements, sampling surface dust and air for lead, observation of work practices and procedures, and employee interviews.

6. FINDINGS AND DISCUSSION.

a. Description of Operations. The Armory contained a Drill Hall, classrooms, offices, and storage space. The FMS #8A had one vehicle bay, offices, and small shops.

b. Occupational Safety and Health Programs. There was no written Hazard Communication Program on site. The FMS #8A had a Material Safety Data Sheet binder that was being reorganized at the time of the site visit. There were no written Hearing Conservation Program or records on site, although the foreman reported that personnel were provided audiograms annually.

c. Building Condition.

(1) Physical Condition. The buildings were in good physical condition with the exception of two active rain leaks in the FMS #8A, discussed below.

(2) Housekeeping. The standard of housekeeping was very high.

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d. Indoor Environmental Quality.

(1) Heating, Ventilation, and Air-Conditioning Systems .

(a) Armory. The Armory building had two roof-mounted heating and ventilating units, one serving the Drill Hall and the other serving the rest of the building. These were reported to be unreliable. The ventilation system for the former IFR was reportedly still operable.

(b) The FMS #8A. The FMS #8A was served by two rooftop heating and ventilating units, one serving the Vehicle Bay 151 and the other serving the rest of the building. The FMS #8A personnel reported that both units had a history of failing to start. They also reported that the bay experienced severe stratification in the winter when the air handling unit (AHU) was running. The Shop Office 152, Electronics Room 153, and Lunch Room 154 were also served by through-wall cooling units. There was no exhaust flow from the washrooms, indicating that the washroom exhaust fan was not working.

(2) IAQ parameters. The IAQ quality measurements were collected during the initial site visit of 21 August 03. The results are shown in Table 1. The range of outdoor conditions at nearby Andrews Air Force Base during IAQ measurements was 86-89 degrees Fahrenheit (º F) dry-bulb temperature with a 70-73º F dewpoint temperature and a clear sky. The approximate relative humidity (RH) was 54-65 percent. These conditions are not expected to be exceeded more than approximately 2 percent of the year.

TABLE 1. Indoor Air Quality Measurements.

Building	Location	Time	Dry bulb temp, º F	Relative humidity, %	CO_2, ppm	Note
Armory	Drill Hall 103	1007	80.5	68	344	Vehicle door open
	Orderly Room 108	1012	80.2	59	418	2 occupants, several windows open, AC unit running
FMS #8A	Vehicle Bay 151	1155	84.2	69	NR	All vehicle doors open
	Shop Office 152	1353	77	50	390	Occupied occasionally

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(3) Temperature and Humidity Control. The ASHRAE recommends a dry-bulb temperature between 71º and 81º F in the summer at 50 percent RH, and a RH maintained in the range of 30 to 60 percent. The RH exceeded the ASHRAE recommended range in the Drill Hall and Vehicle Bay, and the temperature exceeded the recommended range in the Vehicle Bay. This was to be expected given the open doors and the weather. The reported severe winter temperature stratification is typical of high bays that are supplied with air from the ceiling level. These systems must attempt to force heated air down against its natural buoyancy. Operation of the bay doors exacerbates the problem by injecting large masses of cold outside air near the floor which persist there under the layer of hot air near the roof. A minimal solution would be the installation of ceiling fans, although the unreliable operation of the rooftop unit would also have to be addressed. The best solution for occupant comfort is the replacement of the existing system by an infrared radiant system. These can be designed for either oil or gas. They offer potential energy savings to offset their cost by providing comfort at a lower air temperature than is required for a forced-air vehicle garage heating system because they heat personnel and surfaces directly without heating the air.

(4) Air Exchange Rate. To provide adequate fresh air ventilation, ASHRAE recommends an air exchange rate that prevents the Carbon Dioxide (CO_2) concentration in the room from exceeding 700 parts per million (ppm) more than the outdoor ambient concentration, which is generally about 380 ppm. Indoor CO_2 levels were well within the guidelines in all locations.

(5) Mold. No mold or water damage was observed or reported in the Armory building. A substantial leak was reported in the corner of FMS #8A Tool Crib 160 at the back corner of the wall to Vehicle Bay 151. A small rain leak from the roof-mounted AHU in the same bay was also reported. No mold or major surface damage was observed. However, insulation was probably becoming soaked, and the leaks could result in future mold growth.

e. Water Quality. No concerns were expressed about water quality. No samples were collected.

f. Lead Hazards. The age of the buildings indicated that the presence of lead-based paint was unlikely. No significant deterioration of paint was observed.

(1) Lead Criteria.

(a) Lead in air. The Army has adopted the OSHA 8-hour time-weighted average PEL of 50 milligrams per cubic meter ($\mu g/m^3$).

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(b) Lead in surface dust. The Environmental Protection Agency (EPA) and State of Maryland limits for lead in dust are 40 micrograms per square foot ($\mu g/ft^2$) on floors, 250 $\mu g/ft^2$ on windowsills, and 400 $\mu g/ft^2$ in window troughs. These limits apply to pre-1978 Army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The NGB Region North Industrial Hygiene Office concurs with the USACHPPM recommended maximum level of 200 $\mu g/ft^2$ on floors and frequently contacted surfaces, which is more stringent for windowsills than the EPA/State standards. This level was adopted from OSHA Compliance Letter 02-02-58. Further information is provided in Appendix B.

(2) Lead Results.

(a) Lead in air. All air samples were below the laboratory analytical detection limit for lead in air of 3.0 to 15.0 $\mu g/m^3$ as well as the exposure limit.

(b) Lead in surface dust. Samples were collected in the Armory building. Lead dust wipes sample locations, photograph numbers, and analytical results are shown in Table 2. All sample results that were equal to or exceeded 40 $\mu g/ft^2$ for floors or 200 $\mu g/ft^2$ for other surfaces are highlighted. Two sample results from the bullet trap enclosure in the former IFR exceeded the recommended maximum level of 200 $\mu g/ft^2$ for lead dust on frequently contacted surfaces (the maximum was 290,000 $\mu g/ft^2$). A result from the top of a ceiling baffle above the main IFR floor area was 73 $\mu g/ft^2$. Results from other floor surfaces in the former IFR were slightly elevated compared to those in the rest of the Armory building, but not above any of the criteria. The results inside the trap enclosure show that, unknown to the building occupants, the IFR was indeed used for firing at some time. The presence of these high levels appeared not to have produced hazardous levels in the rest of the IFR or in other parts of the building. However, it is possible that occupants who are unaware of the contamination could inadvertently spread it and create hazardous levels elsewhere by cleaning this enclosure using improper methods, using it for storage, and/or tracking the lead to other parts of the building.

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TABLE 2. Dust-Lead Wipe Locations, Photograph Numbers, and Analytical Results.

Sample No.	Type of Sample	Location	Photo No.	Result, µg/ft²
CH W01	Wipe	Drill Hall 103 floor at center	0006	29
CH W02	Wipe	Drill Hall 103 floor near doors to Rooms 130 and 132	0007	8.6
CH W03	Wipe	Drill Hall 103 floor along wall to Arms Room 104	0008	12
CH W04	Wipe	Drill Hall 103 floor at entrance to Latrines 135-136	0009	<2.8
CH W05	Wipe	Drill Hall 103 floor between center and wall to Latrine 136	0010	6.9
CH W06	Wipe	Former IFR 126 floor behind bullet trap (inside enclosure)	0011	290,000
CH W07	Wipe	Former IFR 126 floor in front of bullet trap (inside enclosure)	0012	2,200
CH W08	Wipe	Former IFR 126 top of table along exterior wall	0013	5.6
CH W09	Wipe	Former IFR 126 floor behind firing line	0014	34
CH W10	Wipe	Former IFR 126 floor in front of firing line	0015	33
CH W11	Wipe	Former IFR 126 floor at midpoint near wall to Corridor 127	0016	9.6
CH W12	Wipe	Corridor 127 floor at door to Former IFR 126	0017	5.2
CH W13	Wipe	Former IFR 126 seat of multi gym machine	0018	5.2
CH W14	Wipe	Former IFR 126 top of baffle near bullet trap	0019	73
CH W15	Wipe	Classroom 117 floor near wall to Corridor 128	0020	3.5
CH W16	Wipe	Lobby 101 floor at center	0021	3.8

g. Other Chemical Hazards.

(1) Asbestos. The site Asbestos Management Program listed ceiling tiles in the Armory building as asbestos-containing materials. The ceiling tiles that were observed in the Armory were intact. The FMS #8A performed asbestos brake shoe and clutch work. SSG [redacted] was reported to have the FMS #8A personnel training records for this task. Personnel reported using a wet method for this work. They had turned in the respirators originally supplied for this work after being advised that they were not necessary.

(2) Carbon Monoxide (CO). The wall-mounted CO monitor in FMS #8A Vehicle Bay 151 was reportedly not working, and a work order had been submitted.

h. Vehicle Tailpipe Exhaust System. A single fan served four drops in the Vehicle Bay. Calculated airflows and hose velocities are shown in Table 3. The system should provide at least 1,500 cubic feet per minute (cfm) exhaust at each drop in accordance with the ACGIH Industrial Ventilation Manual recommendation for 9 liter displacement turbocharged diesel engines run at 1,000 revolutions per minute. This exhaust rate is intended to accommodate large turbocharged diesel engines that are, or may be, maintained at this FMS #8A. None of the drops met the ACGIH criterion.

TABLE 3. Vehicle Tailpipe Exhaust System Performance.

Location	Airflow, cfm	Velocity in hose, ft/min	Note
VE-1	430	2,200	
VE-2	420	2,100	
VE-3	330	1,700	Tear in hose
VE-4	350	1,800	

i. Battery Shop Exhaust System. The Battery Shop fan belt was discovered to be off its pulleys during the initial visit, unknown to shop personnel. The belt was replaced and a total airflow of 200 cfm was measured. The NGB Design Guide 415-2 specifies a minimum airflow of 2 cfm per square foot (ft^2) floor area; other design criteria require an estimate of the maximum number and capacity of batteries present, which was not available. The room was considerably larger than 100 ft^2, so the airflow was less than required.

j. Kitchen Ventilation System, Armory Room 109. The kitchen was equipped with three hoods over a grill surface, a dishwasher, and a sink. The grill hood had a horizontal surface area of 32 ft^2 and was enclosed at the back and one side. Measured airflow was 3,800 cfm, which exceeded the International Conference of Building Officials (ICBO) International Building Code 2000 criterion of 100 times the surface area for kitchen hoods enclosed on one or more sides that serves medium-temperature cooking equipment. The dishwasher hood had a horizontal surface area of 15.8 ft^2 and was enclosed at the back. Measured airflow was 1,400 cfm, which exceeded the ICBO criterion of 50 times the surface area for kitchen hoods enclosed on one or more sides that serve low-temperature cooking equipment. The sink hood had a horizontal surface area of 14 ft^2 and a measured airflow of 1,420 cfm, which also exceeded the criterion. The kitchen was supplied with 2,470 cfm of makeup air and also drew air from the adjoining cafeteria and corridor. The system did not produce an excessive negative pressure that would make door operation difficult and unsafe.

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k. Noise Hazards. The FMS #8A performed vehicle repair operations, such as the use of air tools to remove truck wheels that could exceed occupational exposure limits.

(1) Noise Criteria. The Army-adopted criterion for steady-state noise is an 8-hour time-weighted average of 85 decibels A-weighted, with a 3 dBA exchange rate.

(2) Noise Measurements. Dosimetry was performed while air-powered tools were used to replace truck tires, but the readings were subsequently lost when the dosimeters were accidentally reset. Personnel in the shop were observed to use protective earmuffs while performing this operation.

l. Lighting. Illumination levels were measured in frequently-used offices, Drill Floor 103, FMS #8A Vehicle Bay 151, Armory Supply Room 106, and FMS #8A Tool Crib 160. The results are shown in Table 4. The IESNA recommends a minimum illumination level of 11 to 30 foot-candles (fc) for occasional visual tasks (such as locating tools and supplies), 31 to 50 fc for performing large-scale tasks (such as major vehicle repair operations), and 51 to100 fc for tasks of medium contrast and small size (such as general office work). Lighting levels in the rear of FMS #8A Vehicle Bay 151 did not meet the 31 to 50 fc criterion, even with the sun shining in the open front door. In inclement weather or at night, similarly low levels could be expected throughout much of the bay. The desktop in FMS #8A Tool Crib 160 was also inadequately lit.

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TABLE 4. Illumination Levels.

Building	Room	Location	Illumination, fc	Note
Armory	Drill Floor 103	Rear corner next to Room 133	40	Vehicle door open, sunny
	Drill Floor 103	Rear center	27	Vehicle door open
	Drill Floor 103	Rear corner near Foyer 101	12	Vehicle door open
	Orderly Room 108	Desktop	54	
	Orderly Room 108	Desktop	78	
	Orderly Room 108	Work table	57	
	Supply Room 106	Corridor between shelves	12	
	Supply Room 106	Corridor between shelves	20	
	Classroom 117	Chair near window	85	
	Classroom 117	Chair in center	72	
	Classroom 117	Chair near door	44	
	Classroom 117	Desktop in center	54	
	Kitchen 120	Grill surface	25	
	Kitchen 120	Work table	92	
	Pantry 119	Counter by window	59	
FMS #8A	Vehicle Bay 151	Rear (north)	23-27	South vehicle doors open, bright sun shining in
		4th row of columns from front	26-36	Ditto
		3rd row of columns from front	49-76	Ditto
		2nd row of columns from front	101-147	Ditto
		1st row of columns from front	280-330	Ditto
	Shop Office 152	Desktop	211	
	Tool Crib 160	Shelves	13-20	
		Desktop	26	

m. Safety Observations. The vehicle tailpipe exhaust system was extremely noisy, posing a potential accident hazard by limiting communication. No other hazards were observed.

7. CONCLUSIONS.

a. Lead Hazards. The former IFR had been used but not completely decontaminated. Very high levels of lead in surface dust were found inside an enclosure around the bullet trap. These could lead to an inadvertent spread of lead contamination to other parts of the Armory.

b. Occupational Safety and Health Programs. Written Hazard Communication and Hearing Conservation Programs should be provided and implemented. Records of training, audiograms and other activities must be maintained.

c. Ventilation Deficiencies. The rooftop heating and ventilation units serving both buildings were unreliable. The washroom fan in the FMS #8A was not operating. The Vehicle Bay had severe air stratification in cold weather. The vehicle tailpipe and Battery Room exhaust systems had inadequate airflows, and the fan for the former was excessively noisy. One tailpipe hose was torn.

d. Other Deficiencies. The FMS #8A Vehicle Bay and Tool Crib desktop were inadequately lit. There were two active rain leaks in the FMS #8A. Ergonomic and noise hazards needed to be evaluated and mitigated. The CO monitor in the Vehicle Bay was broken.

8. RECOMMENDATIONS.

a. Lead Exposure. Health RAC 4.

(1) Restrict access to the bullet trap enclosure in the former IFR by keeping it locked. Post a sign warning against use of the enclosure for entry except in an emergency, or for storing of any material.

(2) If the enclosure area is renovated, clean all surfaces to the maximum level recommended by the NGB Region North Industrial Hygiene Office and USACHPPM. Comprehensive guidelines are in Appendix E. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. Apply a sealant to the area after decontaminating the enclosure.

b. Occupational Safety and Health Programs. Health RAC 4. Develop and implement written Hazard Communication and Hearing Conservation Programs. Maintain records of training, audiograms, and other activities.

c. General HVAC Systems. Health RAC 4. Investigate rooftop unit operating problems and repair or replace units as necessary. In FMS #8A Vehicle Bay 151, at minimum, install ceiling

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fans to reduce stratification. Investigate the potential replacement of the existing system by an infrared radiant system. Repair or replace the FMS #8A washroom fan.

d. Vehicle Tailpipe Exhaust System. Health RAC 3. Repair or disconnect the leaking hose. Modify or upgrade the system to provide at least 1,500 cfm per drop. One possibility is to reduce the number of connection points. Investigate the excessive fan noise and repair as needed.

e. Battery Room Exhaust System. Safety RAC 4. Adjust or replace the fan to provide at least 2 cfm per square foot of floor area.

f. Building Physical Condition. Health RAC 4. Repair the two active roof leaks in the FMS #8A and replace any damaged building materials.

g. Lighting. Health RAC 4. Provide additional task lighting in FMS #8A Vehicle Bay 151 and Tool Crib to meet illumination standards.

h. Noise Hazards. No RAC can be assigned. Assess noise hazards and implement control measures as appropriate.

i. Other Hazards. Safety RAC 3. Ensure that the CO monitor in FMS #8A Vehicle Bay 151 is repaired and calibrated.

9. ADDITIONAL ASSISTANCE. For additional assistance, or questions concerning this report, please contact the undersigned at commercial 410-436-3118, DSN 584-3118, or by e-mail: [redacted]@us.army.mil.

[redacted]
Industrial Hygienist
USACHPPM Lead and Asbestos Team Leader
Industrial Hygiene Field Services Program

APPROVED:

[redacted]
Program Manager
Industrial Hygiene Field Services Program

APPENDIX A

REFERENCES

1. Occupational Safety and Health Administration, Title 29, Code of Federal Regulations (CFR), Part 1910, current ed. 1910.1025 (Lead). http://www.osha.gov/comp-links.html

2. Occupational Safety and Health Administration, Title 29, Code of Federal Regulations (CFR), Part 1910 for General Industry and current ed. 1910.1200 (Hazard Communication). http://www.osha.gov/comp-links.html

3 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 62.1-2004, Ventilation for Acceptable Indoor Air Quality. http://www.ashrae.org

4. DA PAM 40-501, Medical Services, Hearing Conservation Program, 10 December 1998. http://www.usapaarmy.mil/pdffiles/p40-501.pdf

5. Illuminating Engineering Society of North America, ANSI/IESNA RP-1-04, Office Lighting.

6. IESNA RP-7-01, Lighting Industrial Facilities.

7. EPA 40 CFR Part 745, Lead; Identification of Dangerous Levels of Lead; Final Rule, 5 Jan 2001.

8. Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program, 19 August 1998. http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf

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APPENDIX B

PROPOSED LEAD CRITERIA

Subject: Recommendations for Surface Lead Dust in Armories

1. In armories that do not contain childcare facilities, the National Guard Bureau (NGB) Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 micrograms per square foot ($\mu g/ft^2$). If a special function will be held in which children will be present in this facility, consider thoroughly cleaning the areas that will be accessible to children prior to the function. This guidance is based on professional judgment, risk assessments, adaptation of Occupational Safety and Health Administration (OSHA) guidance, and feasibility of cleaning to a certain level.

a. Environmental Protection Agency (EPA) standards (40 Code of Federal Regulations (CFR) 745.227(h)(3)) are not directly applicable because they are criteria for dust-lead hazards developed for floors (40 $\mu g/ft^2$) and windowsills (250 $\mu g/ft^2$) in residential dwellings and child occupied facilities. A child occupied facility is defined as a building, or portion of a building, constructed prior to 1978, visited regularly by the same child, 6 years of age or under, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hours and the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60 hours. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. OSHA has no specific requirement for work area surfaces. The lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead dust. In workplaces where lead dust is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. OSHA used to cite a level of 200 $\mu g/ft^2$ in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 $\mu g/ft^2$ is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

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e. It should be noted that levels above these recommendations do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All states will receive this guidance when it is completed. In the interim, we recommend the following actions:

a. Clean all areas that will be accessible to children to the EPA dust-lead standard for children 6 years of age or under (40 $\mu g/ft^2$ on floors and 250 $\mu g/ft^2$ on windowsills).

b. Refer to the local authorities' regulations since they can be more stringent than Federal regulations.

c. Post signs in the area to inform people of the presence of lead dust and its effects.

d. If Soldiers clean weapons in the facility change the policy so that they cannot clean their weapons in the facility, or if they are allowed to clean their weapons indoors, they must clean the area by wet wiping and mopping the area when they are done.

e. If the paint is peeling, contact the state Environmental Office to test for lead content and provide recommendations.1

3. Air samples collected on individuals in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m^3 averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead dust in this building.

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APPENDIX C

PHOTOGRAPHS

Photograph No.	Sample Location
1	Drill Hall 103, floor at center
2	Drill Hall 103, floor near doors to Rooms #8A 130 and 132
3	Drill Hall 103, floor along wall to Arms Room 104
4	Drill Hall 103, floor at entrance to Latrines 135-136
5	Drill Hall 103, floor between center and wall to Latrine 136
6	Former IFR 126, floor behind bullet trap (inside enclosure)
7	Former IFR 126, floor in front of bullet trap (inside enclosure)
8	Former IFR 126, top of table along exterior wall
9	Former IFR 126, floor behind firing line
10	Former IFR 126, floor in front of firing line
11	Former IFR 126, floor at midpoint near wall to Corridor 127
12	Corridor 127, floor at door to Former IFR 126
13	Former IFR 126, seat of multi gym machine
14	Former IFR 126, top of baffle near bullet trap
15	Classroom,117 floor near wall to Corridor 128
16	Lobby 101, floor at center

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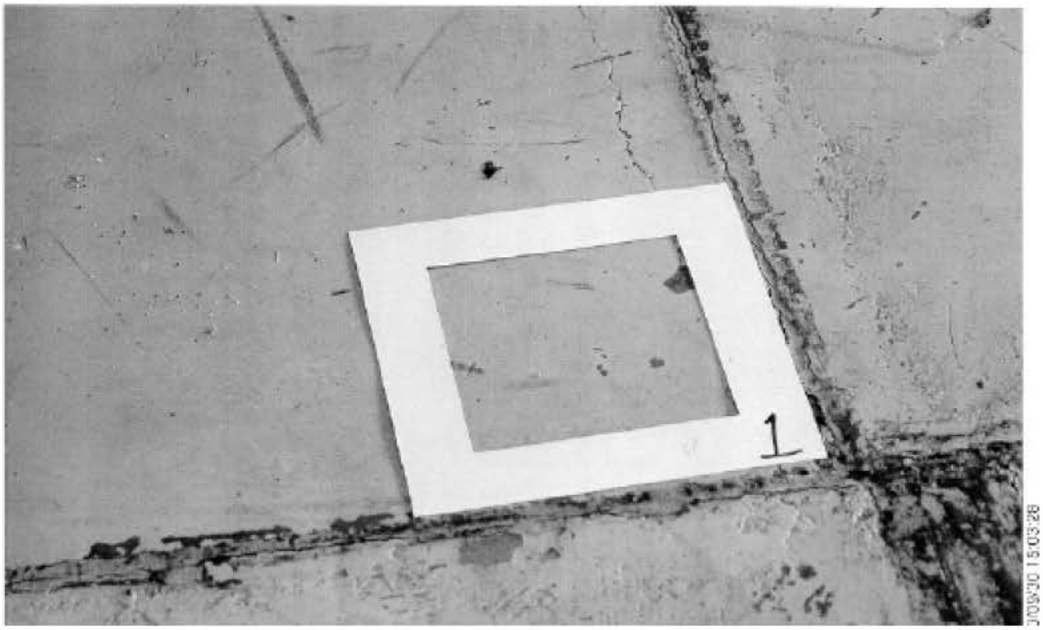

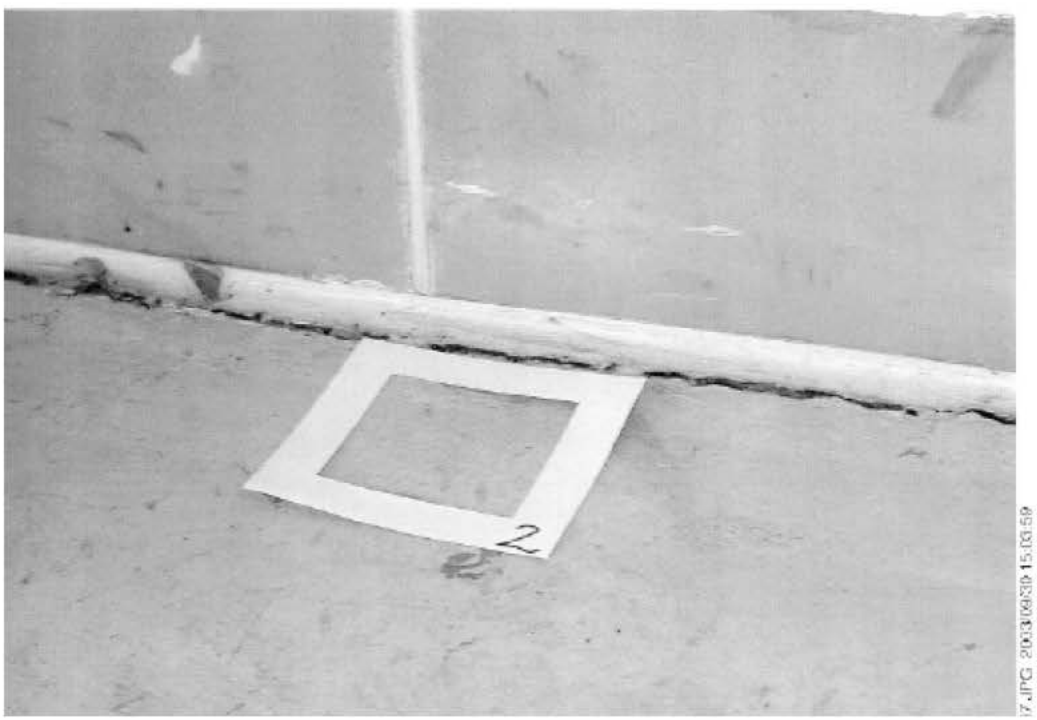

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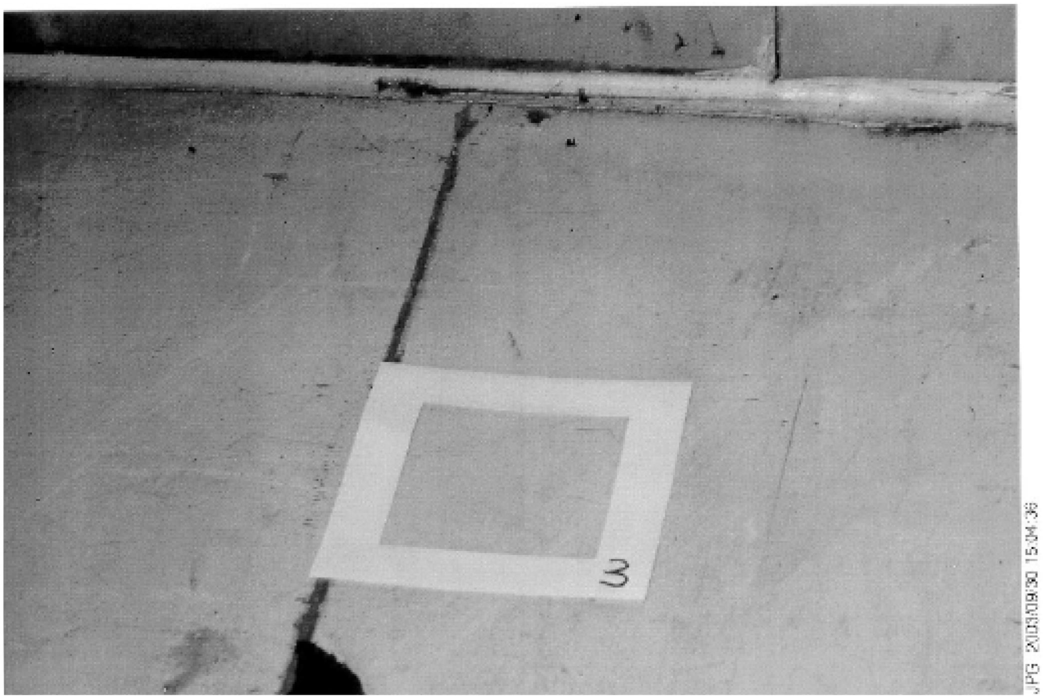

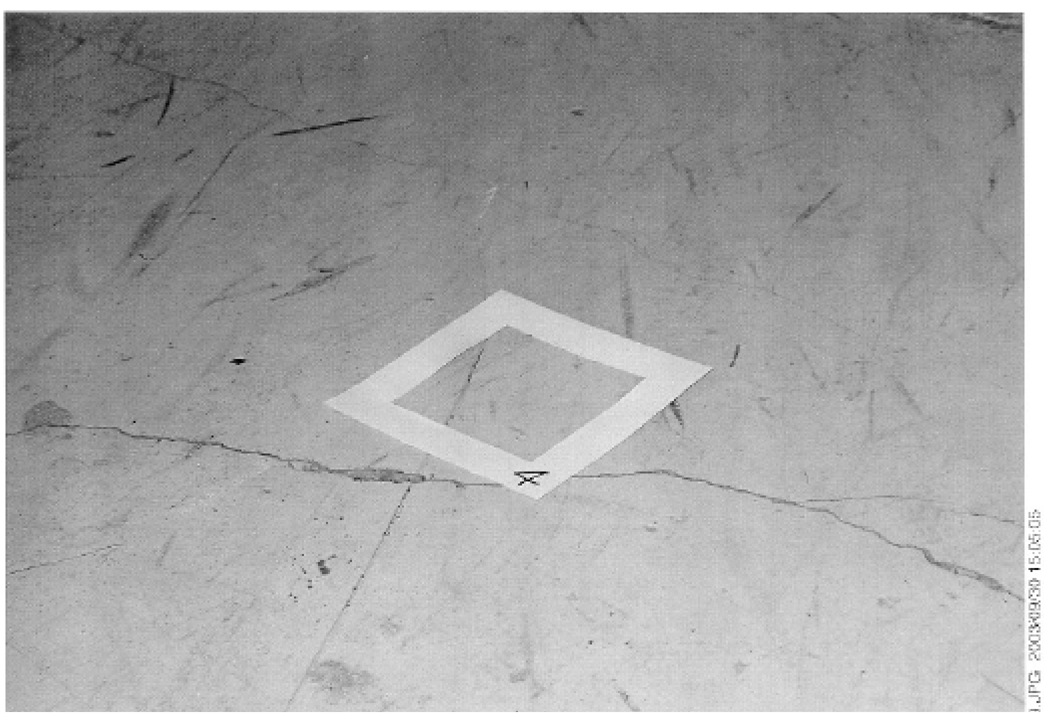

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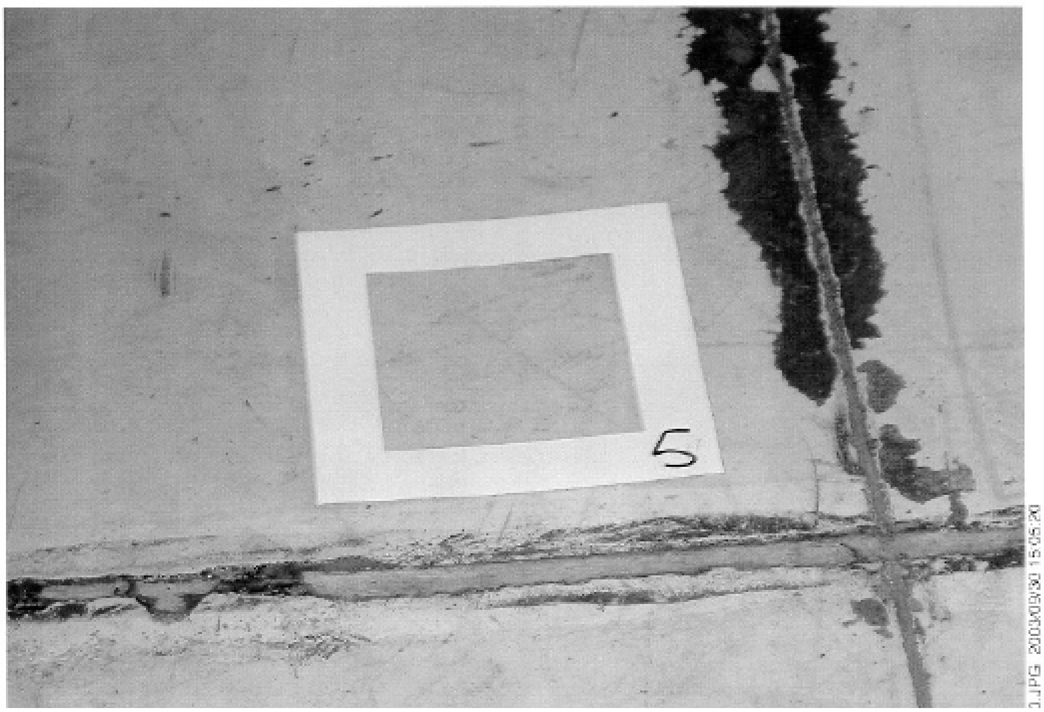

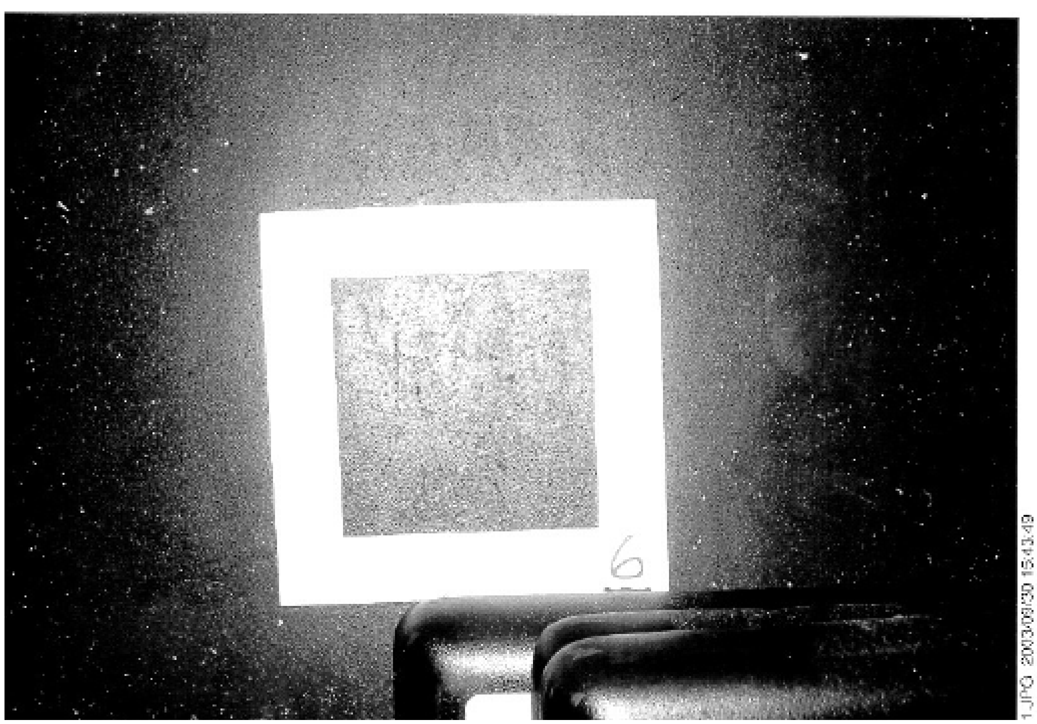

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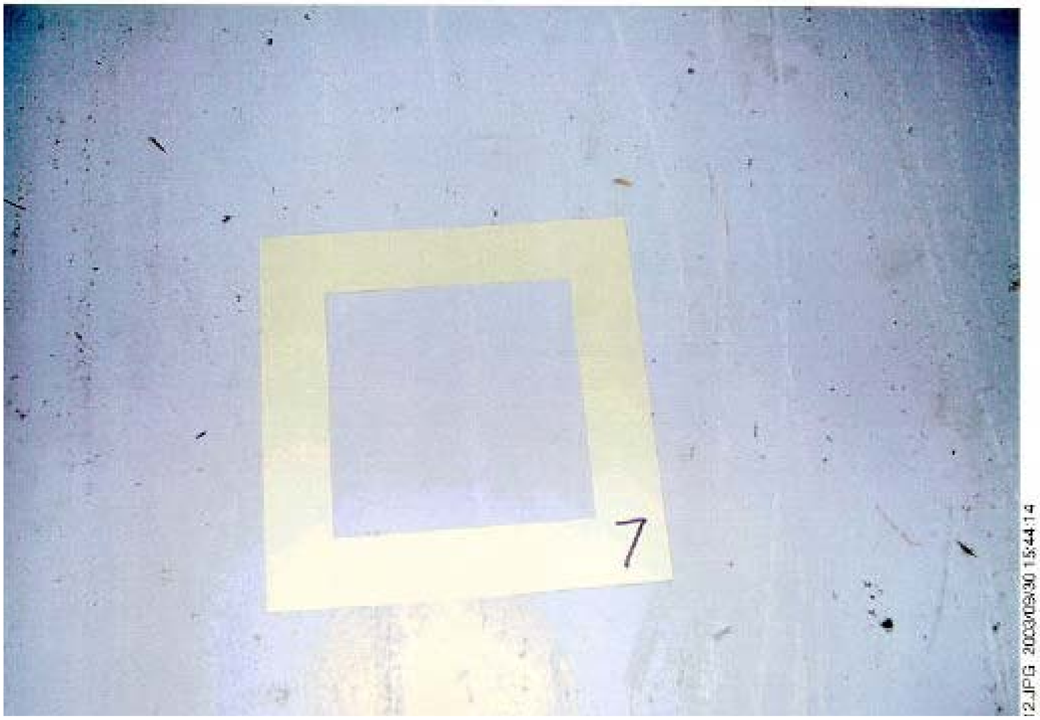

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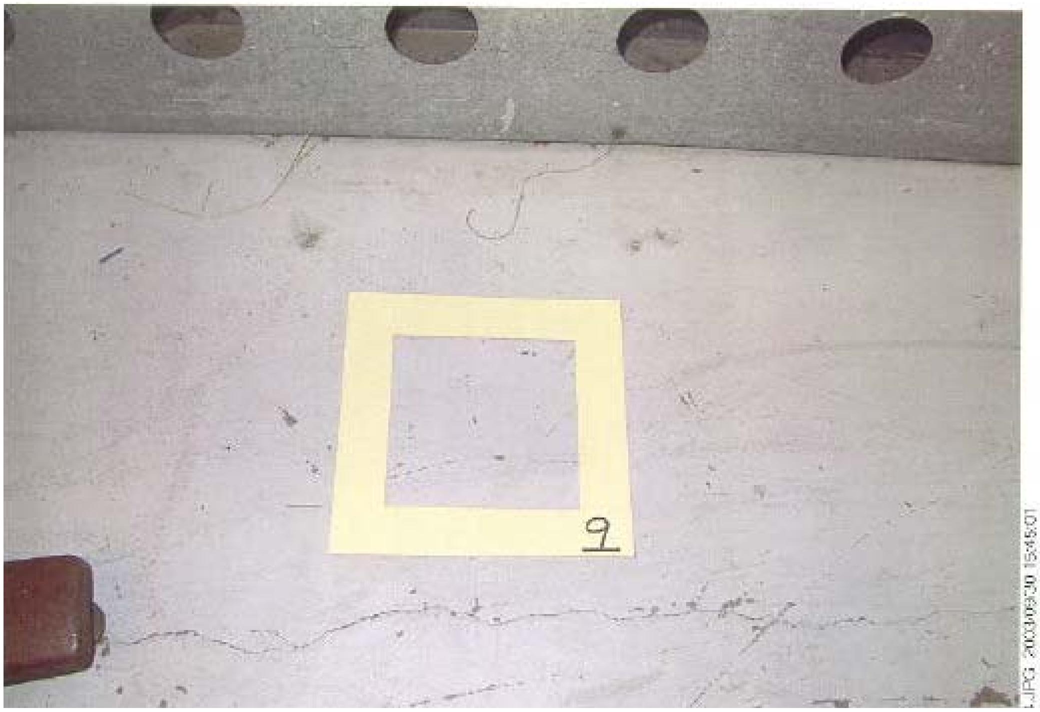

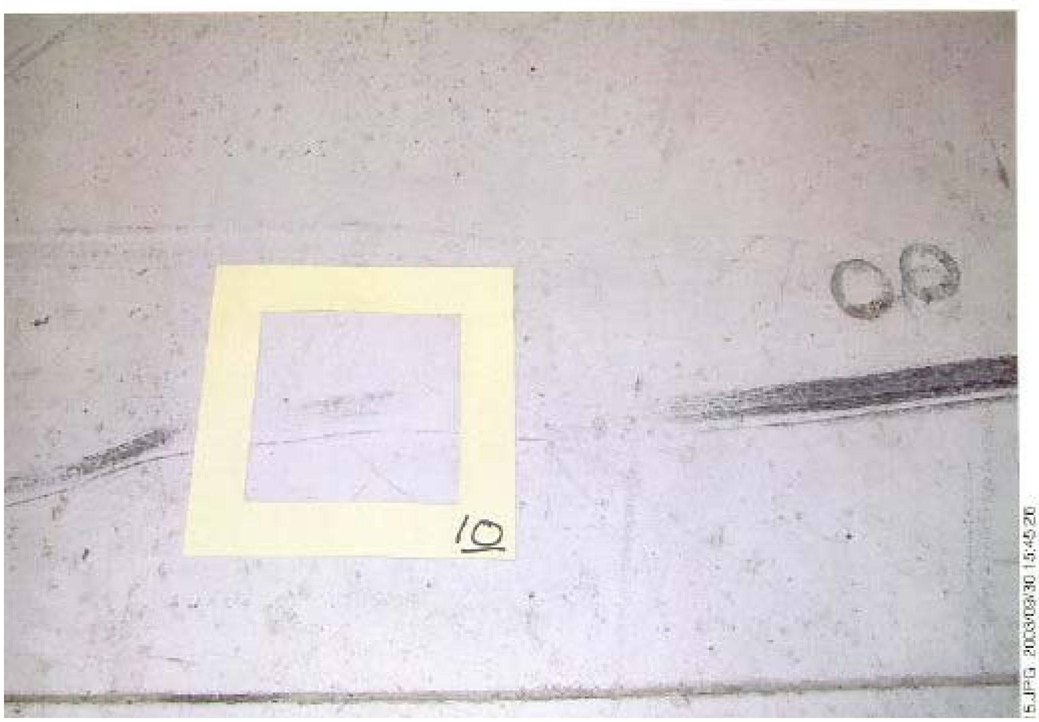

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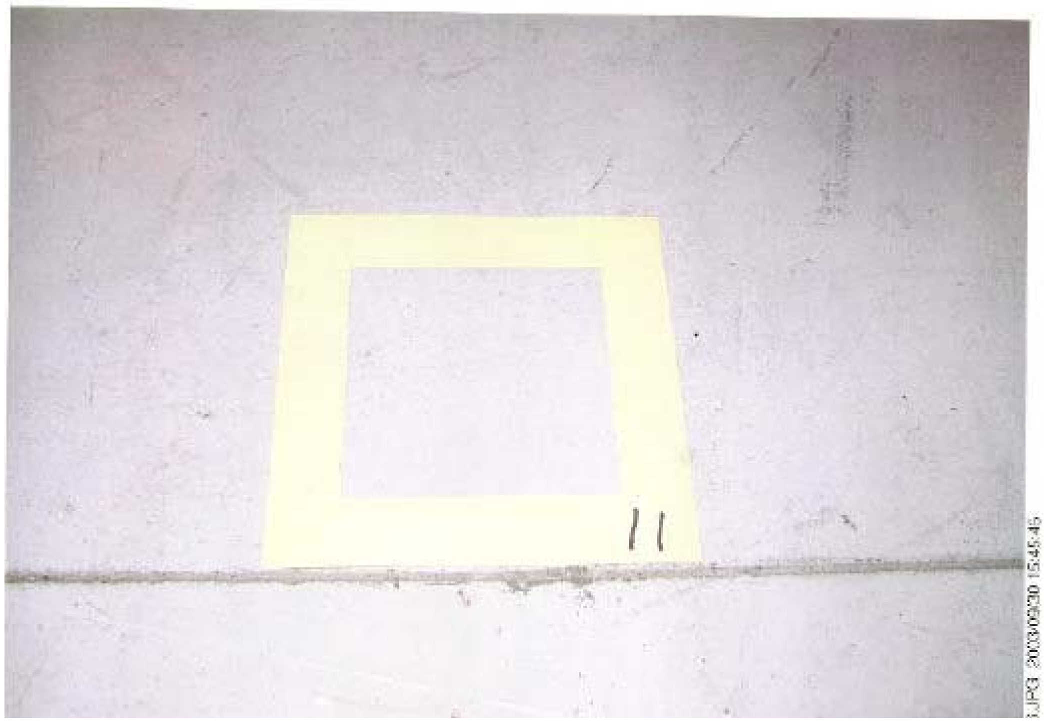

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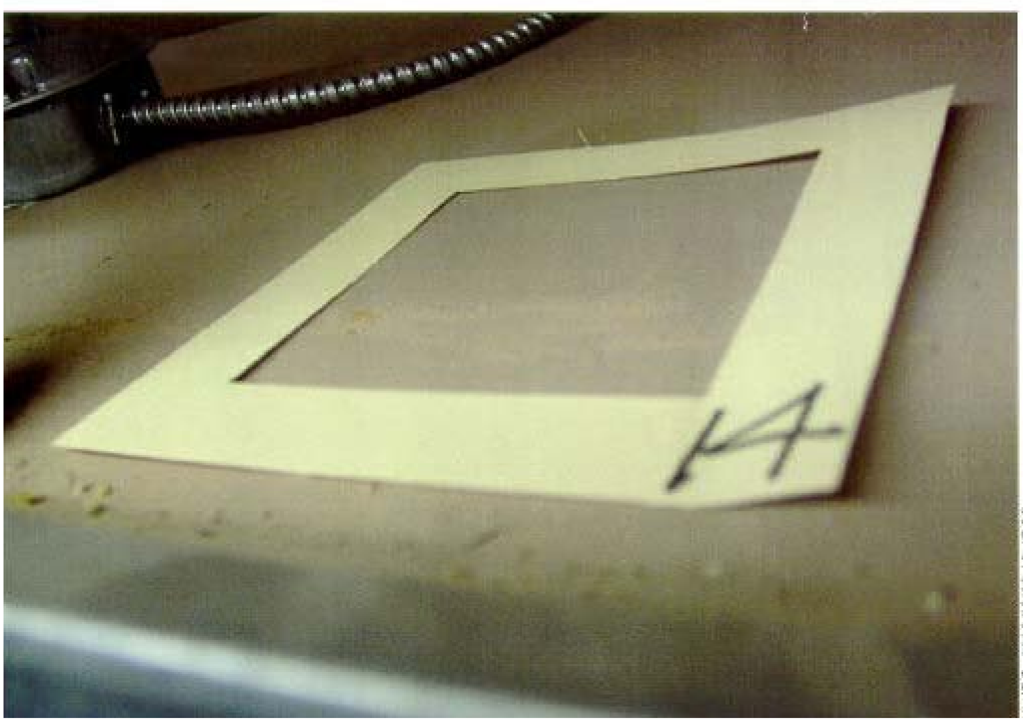

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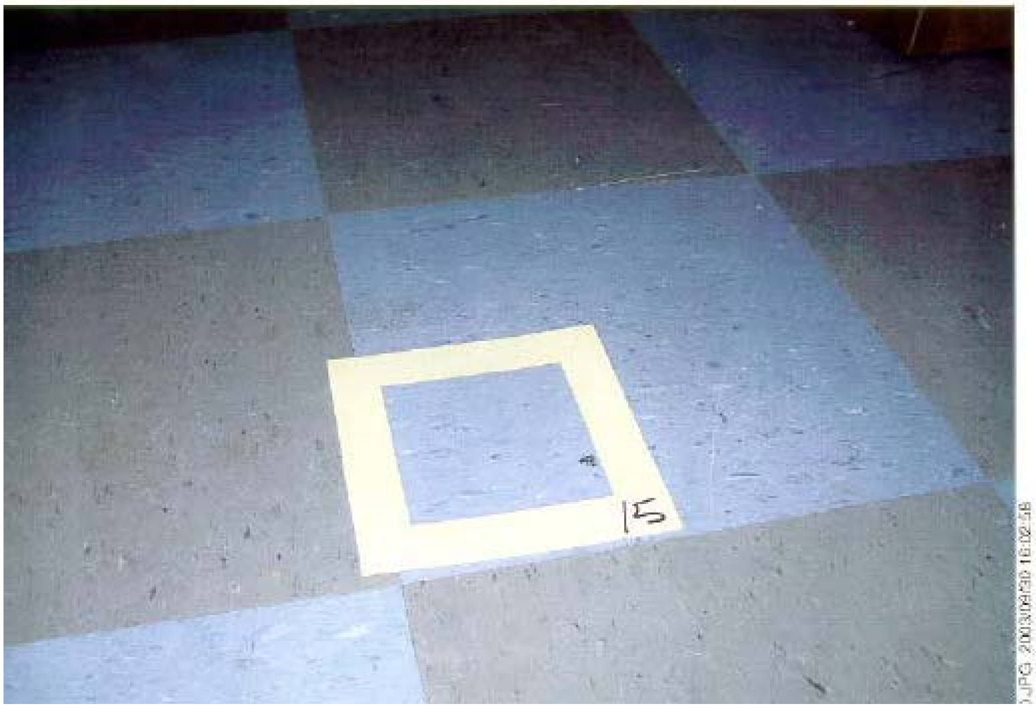

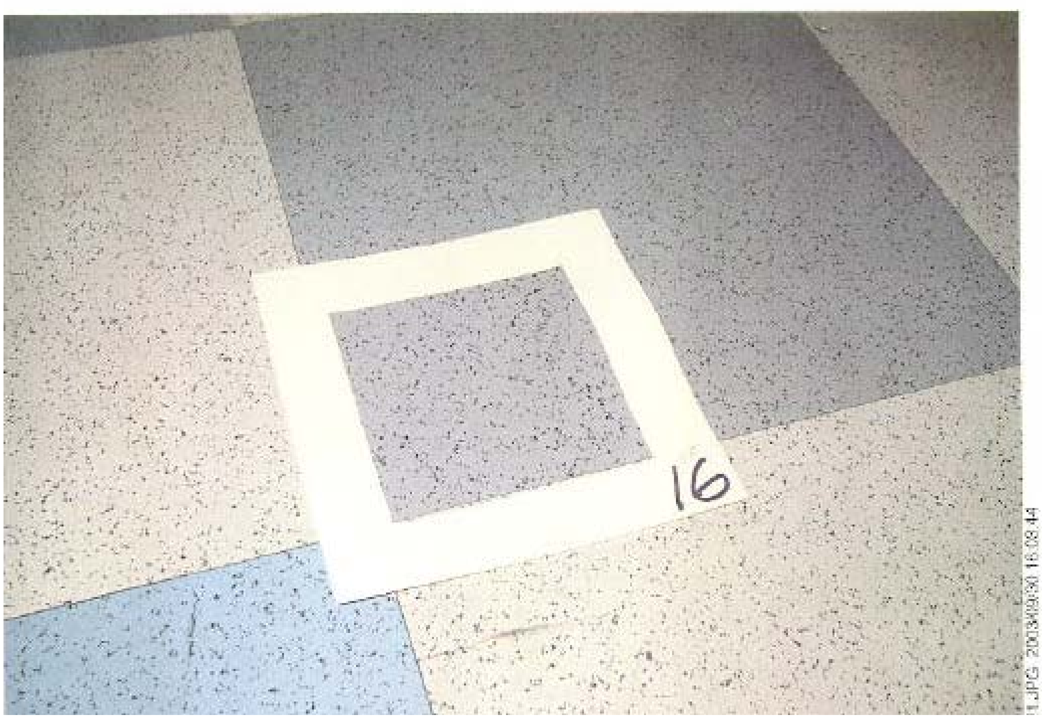

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APPENDIX D

LABORATORY REPORTS

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP NY ELAP AIHA

Client: US Army - CHPPM
Address: Attn: MCHB-TS-OFS, 5158 Blackhawk Road
Aberdeen Proving Grounds, Maryland
21010-5403

Attention: [redacted]

Job Name: Nationa Guard
Job Location: Cheltenham & Oleny Armories
Job Number: Not Provided
P.O. Number: Not Provided

Chain Of Custody: 116954
Date Analyzed:
Person Submitting: [redacted]
Report Date: 09-Oct-03

Page 1 of 1

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Final Result	Comments
0401849	OLAIRBlank 01	Flame	Air Blank	0	N/A	3.00 ug/m³	< 3 ug	
0401850	OLAIR 01	Flame	Air	263	N/A	11.41 ug/m³	< 11 ug/m³	
0401851	OLAIR 02	Flame	Air	249	N/A	12.05 ug/m³	< 12 ug/m³	
0401852	CHAIRBlank 01	Flame	Air Blank	0	N/A	3.00 ug/m³	< 3 ug	
0401853	CHAIR 01	Flame	Air	300	N/A	10.00 ug/m³	< 10 ug/m³	
0401854	CHAIR 02	Flame	Air	272	N/A	11.03 ug/m³	< 11 ug/m³	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Analyst: Daniel P. Swanson **Technical Manager:** G Edward Carney

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP
NY ELAP
AIHA

Client:	US Army - CHPPM	**Job Name:**	National Guard	**Chain Of Custody:**	116958
Address:	Attn: MCHB-TS-OES, 5158 Blackhawk Road Aberdeen Proving Grounds, Maryland 21010-5403	**Job Location:**	Cheltenham Armory	**Date Analyzed:**	10/13/2003
		Job Number:	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	13-Oct-03
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0401873	CHWBlank 01	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0401874	CHW 01	Furnace	Wipe	****	0.108	2.79	ug/ft²		29	ug/ft²	
0401875	CHW 02	Furnace	Wipe	****	0.108	2.79	ug/ft²		8.6	ug/ft²	
0401876	CHW 03	Furnace	Wipe	****	0.108	2.79	ug/ft²		12	ug/ft²	
0401877	CHW 04	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/ft²	
0401878	CHW 05	Furnace	Wipe	****	0.108	2.79	ug/ft²		6.9	ug/ft²	
0401879	CHWBlank 02	Furnace	Wipe Blank	****	0.108	2.79	ug/ft²	<	2.8	ug/ft²	
0401880	CHW 06	Furnace	Wipe	****	0.108	174256.51	ug/ft²		290000	ug/ft²	
0401881	CHW 07	Furnace	Wipe	****	0.108	1394.05	ug/ft²		2200	ug/ft²	
0401882	CHW 08	Furnace	Wipe	****	0.108	2.79	ug/ft²		5.6	ug/ft²	
0401883	CHW 09	Furnace	Wipe	****	0.108	5.58	ug/ft²		34	ug/ft²	
0401884	CHW 10	Furnace	Wipe	****	0.108	5.58	ug/ft²		33	ug/ft²	
0401885	CHWBlank 03	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0401886	CHW 11	Furnace	Wipe	****	0.108	2.79	ug/ft²		9.6	ug/ft²	
0401887	CHW 12	Furnace	Wipe	****	0.108	2.79	ug/ft²		5.2	ug/ft²	
0401888	CHW 13	Furnace	Wipe	****	0.108	2.79	ug/ft²		5.2	ug/ft²	
0401889	CHW 14	Furnace	Wipe	****	0.108	13.94	ug/ft²		73	ug/ft²	
0401890	CHW 15	Furnace	Wipe	****	0.108	2.79	ug/ft²		3.5	ug/ft²	
0401891	CHWBlank 04	Furnace	Wipe Blank	****	0.108	2.79	ug/ft²	<	2.8	ug/ft²	
0401892	CHW 16	Furnace	Wipe	****	0.108	2.79	ug/ft²		3.8	ug/ft²	

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APPENDIX E
LEAD CLEANING GUIDANCE

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Chapter 14: Cleaning

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
3. Have sufficient cleaning equipment and supplies *before* beginning work.
4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
13. Paint or otherwise seal treated surfaces and interior floors.
14. Conduct a clearance examination (see Chapter 15).
15. If clearance is not achieved, repeat the final cleaning.

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16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.

17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.

18. Cleaning equipment list:

    - HEPA vacuums.
    - Detergent.
    - Waterproof gloves.
    - Rags.
    - Sponges.
    - Mops.
    - Buckets.
    - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
    - 6-mil plastic bags.
    - Debris containers.
    - Waste water containers.
    - Shovels.
    - Rakes.
    - Water-misting sprayers.
    - 6-mil polyethylene sheeting (or equivalent).

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Chapter 14: Cleaning

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris *and* dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?
- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

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Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards *and* were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

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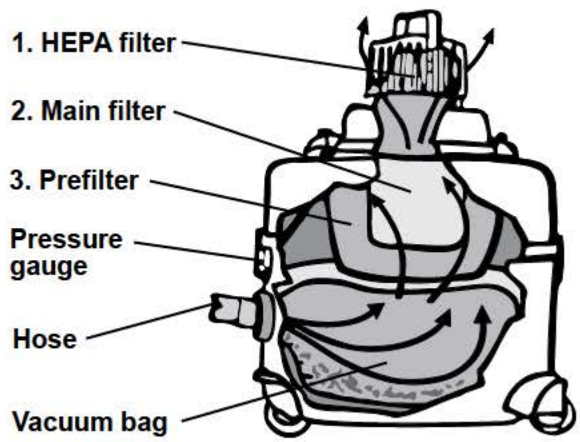
Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and pre-filter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the pre-filter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

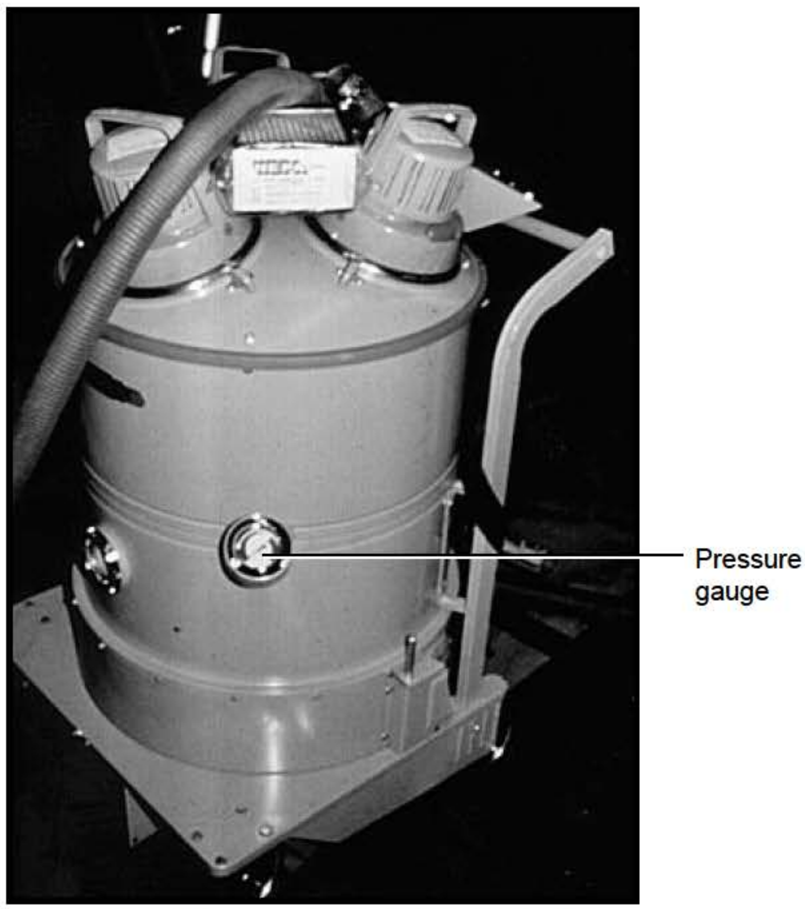


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

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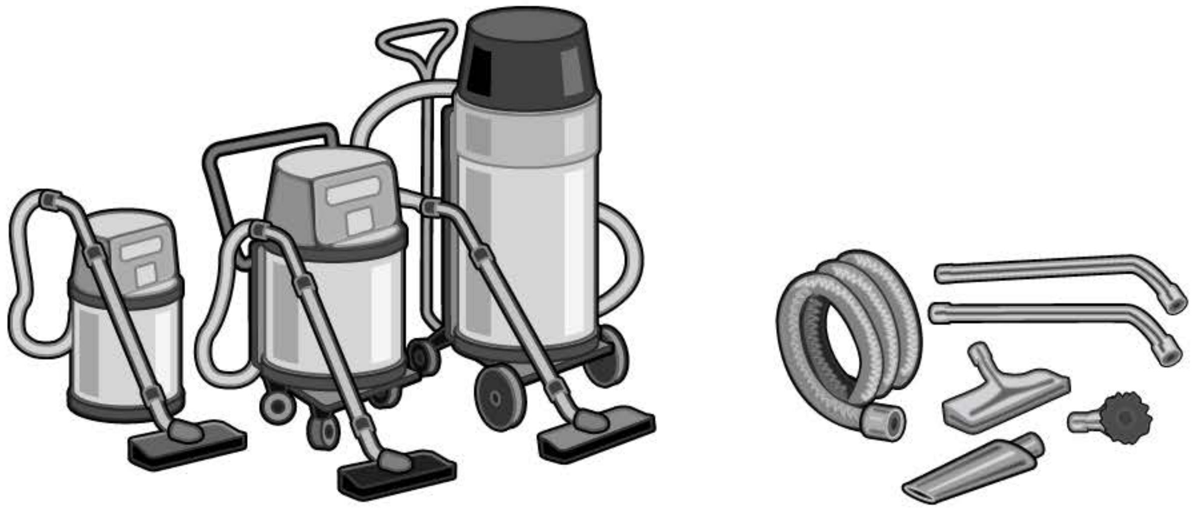
Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

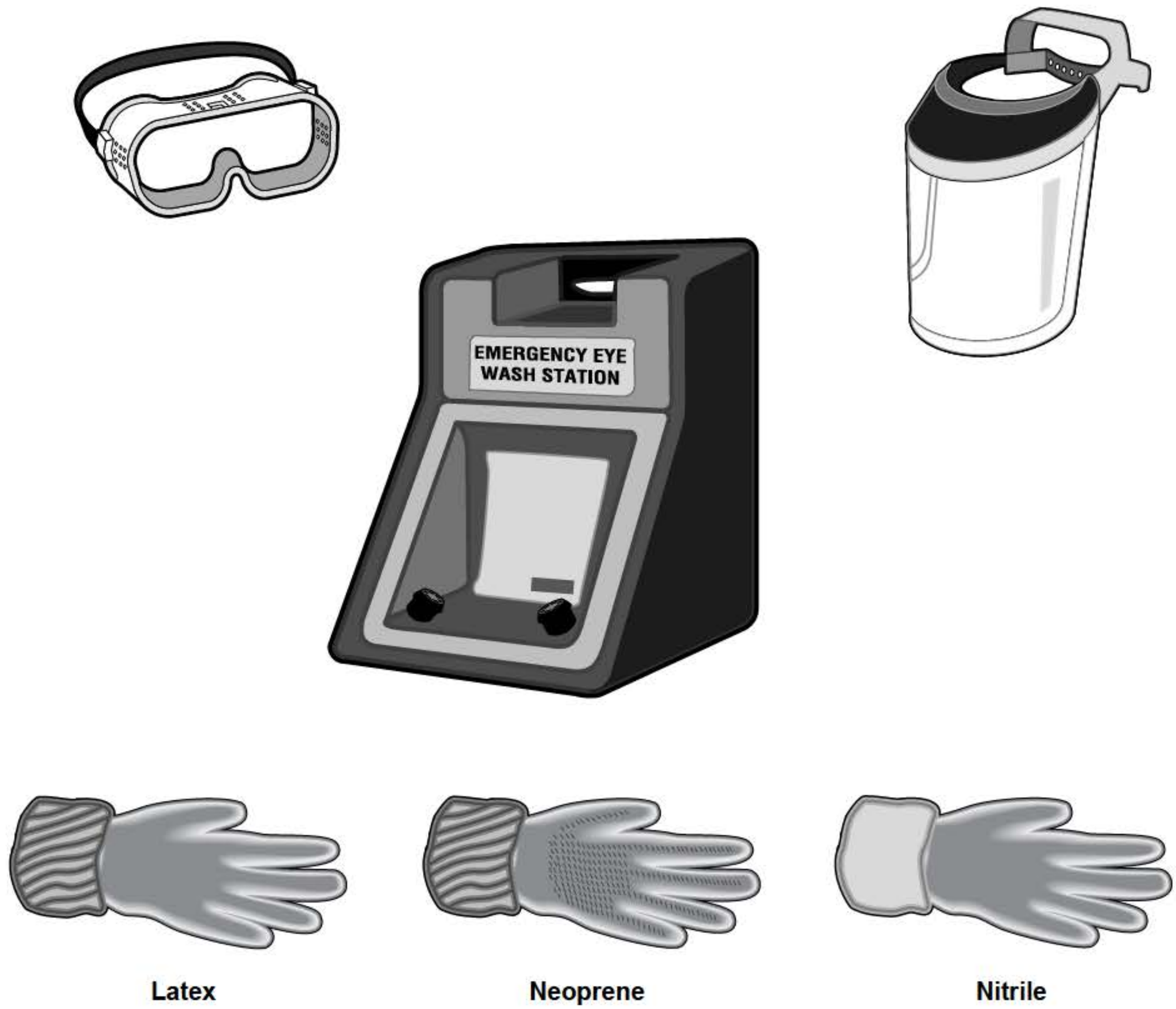
Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

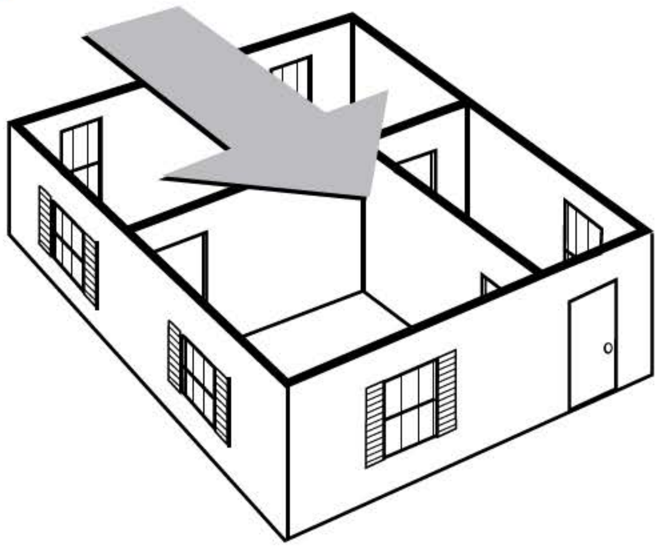
Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

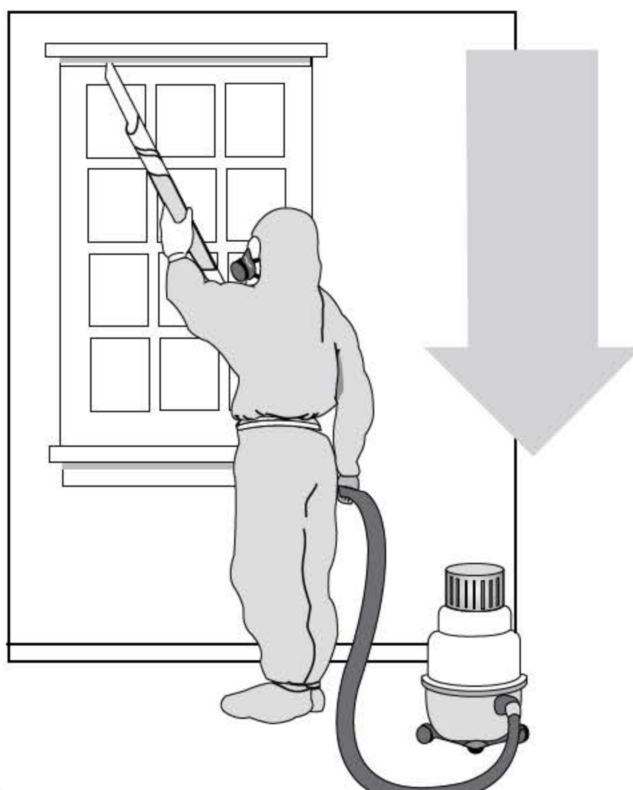
- First, the area is HEPA vacuumed.

Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on, and work down to the floor. Do every inch of the windows, especially the window troughs.



Courtesy: Alice Hamilton Occupational Health Center

- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.

Rubber Cone

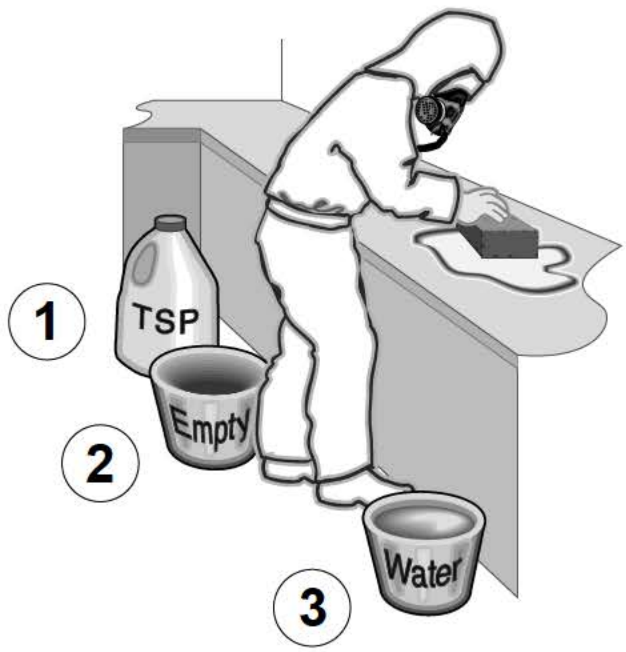
Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

Figure 14.4c (continued)

Wash all surfaces with suitable detergents
Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces

Wet Mop Floor

Don't Dry Sweep

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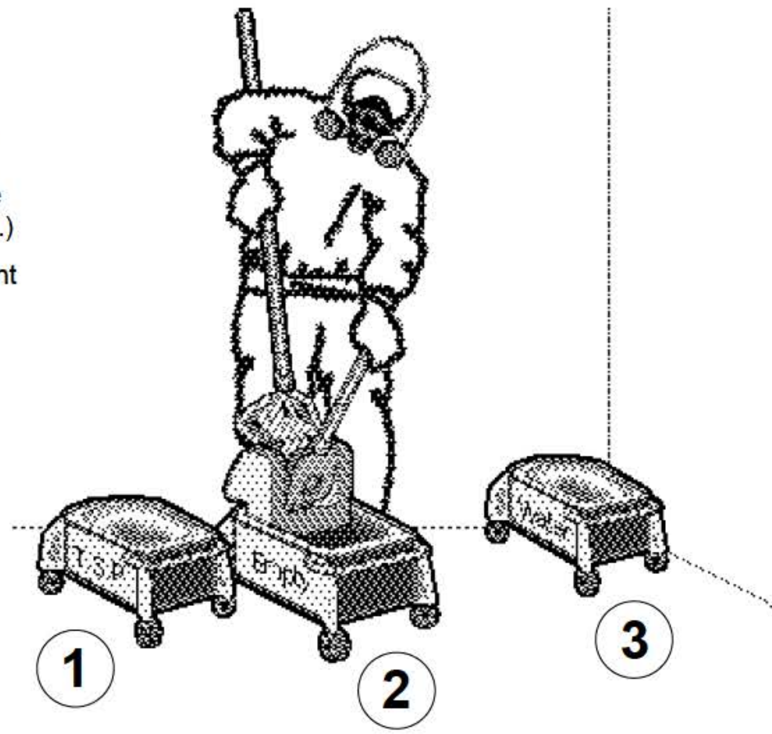
Figure 14.4c (continued)

Use the 3-Bucket System.

To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.



Squeeze out the mophead in empty bucket #2. Return to bucket #1 for more detergent solution and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

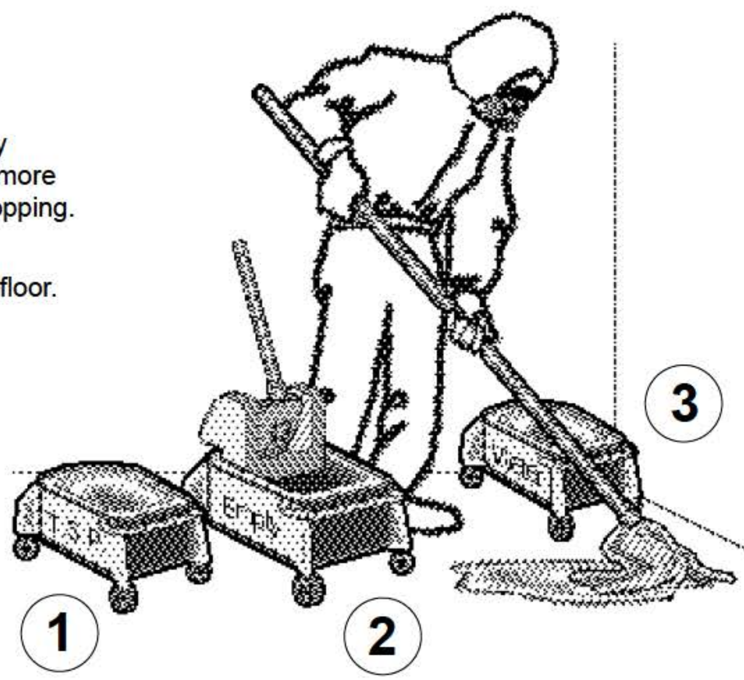
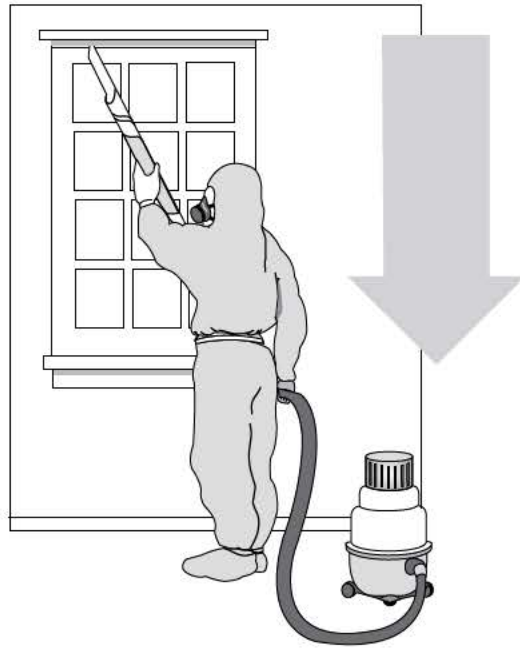


Figure 14.4d (continued)

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.

Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

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belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water *and cleaned.* All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).

Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This

option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dust-retaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table 14.1 Initial Cleaning Wipe-Test Failure Rates for Various Abatement Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)

and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993).

These *Guidelines* do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Cycle Number	Mass Removal Efficiency Percentages			
	Cleaning Method			
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.8	67.0	29.4
5	59.3	88.9	72.1	32.5
6	61.6	91.2	74.4	34.9
7	63.8	93.1	76.4	36.5
8	67.5	95.4	77.5	38.1
9	67.5	97.7	78.7	40.1
10	67.2	100.0	80.2	41.7
11		102.3	80.2	41.7
12		104.6	84.1	44.8
13		104.6	84.5	46.8
14		103.8	84.5	48.4
15				49.6
16				50.8
17				52.4
18				53.6
19				54.4
20				55.2

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) *Effectiveness of Clean-up Techniques for Leaded Paint Dust*

ENGINEERS

1720 Walton Road Blue Bell, PA 19422 610-828-3078 Fax 610-828-7842

February 9, 2009

<u>E-MAIL</u>
Ms. [redacted]
NGB Regional Industrial Hygienist
Army National Guard
ATTN: NGB-ARS-IHNE
301-IH Old Bay Lane
Havre de Grace, MD 21078

Subject: Draft Industrial Hygiene Assessment Report
Cheltenham Readiness Center, Cheltenham, Maryland 20623
IES Project No. EHS08794.02

Dear Shirley:

IES Engineers (IES) is pleased to enclose the final report of the Industrial Hygiene assessment conducted at the Army National Guard Readiness Center facility located in Cheltenham, Maryland. Thank you for the opportunity to perform this assessment. Should you have any questions, please contact [redacted] or me.

Sincerely,

[redacted] e/
[redacted], CIH
Senior Manager, Health, Safety
& Industrial Hygiene Services

cc: [redacted], ARNG
[redacted], IES
[redacted], IES

IES ENGINEERS

NATIONAL GUARD BUREAU
REGION NORTH INDUSTRIAL HYGIENE OFFICE
HAVRE DE GRACE, MARYLAND

FINAL
INDUSTRIAL HYGIENE ASSESSMENT
CHELTENHAM READINESS CENTER
9900 SURRATTS ROAD, CHELTENHAM, MD 20623
SURVEY DATE: JULY 25, 2008

IES PROJECT NO. EHS08794.02
REPORT DATE: FEBRUARY 9, 2009

Prepared and submitted by:

Non-Responsive [redacted]

[redacted]
Industrial Hygienist

Certified Industrial Hygienist review by:

[redacted]

[redacted] CIH
Senior Manager, Health, Safety & Industrial Hygiene Services

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IES ENGINEERS

1.0 EXECUTIVE SUMMARY

1.1 Introduction

Assessment Date: July 25, 2008

Purpose: The National Guard Bureau (NGB) retained IES Engineers (IES) to assist it in performing an Industrial Hygiene assessment at the Army National Guard (ARNG) Readiness Center (RC) located at 9900 Surratt Road in Cheltenham, Maryland. The purpose of the Industrial Hygiene survey was to identify and measure the existence and extent of potentially hazardous operations or conditions at the ARNG facility. Mr. [redacted], Industrial Hygienist, of IES, performed the assessment under the direction of Mr [redacted], CIH, Senior Manager, Health, Safety & Industrial Hygiene Services, of IES. The assessment included: evaluations of operations, including engineering, work practice, administrative, and/or personal protective equipment (PPE) controls; ventilation system evaluations, including visual observations of airflow and quantitative assessments of general ventilation systems; illumination measurements and observations of the facility and conditions.

Conferred With: SFC [redacted], Supervisor, Cheltenham Readiness Center

1.2 Facility Description

Cheltenham Armory/RC, located at 9900 Surratts Road, Cheltenham, Maryland is a 6,600-square foot training facility constructed of an exterior of brick and block masonry on a concrete slab. The interior construction is mostly painted block wall. The facility has a built up roof top atop corrugated metal decking. The facility contains offices, training rooms, a drill hall, kitchen and a former Indoor Firing Range (IFR) that was converted into a fitness center. Photographs of the facility are located in Appendix A of this report.

The RC is a one story training facility that was built around 1995. The interior walls of the multi-room facility are of block construction. A majority of ceilings within the facility are drop ceilings. The facility is not ventilated through a single system, but a majority of the offices have floor-mounted units to cool the space in the warmer months of the year. Normal working hours for the four full time personnel are generally Tuesday through Friday from 0630 to 1700. Training at the facility occurs once a month for a weekend in duration. On the day of the IH assessment, the shop was maintained by one administration personnel and one maintenance personnel.

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1.3 Findings and Conclusions

The main findings and conclusions of the assessment are:

- On the day of the assessment there were two on-site personnel, who work directly with the Readiness Center. During a normal 10-hour day, the supervisors performed logistical work. Care of the facility is maintained by an outside contractor.

- Airborne lead was not detected in either of the two general area air samples collected on the day of the assessment. The airborne lead concentrations in each of the air samples were reported at less than 4.6 micrograms of lead per cubic meter of air ($\mu g/m^3$), which is well below the OSHA Action Level of 40 $\mu g/m^3$ for lead over a 10-hour workday.

- Wipe samples for lead that were collected from various horizontal surfaces throughout the Readiness Center indicated that the surface lead concentrations in certain areas exceeded the recommended precautionary level of 200 micrograms of lead per square foot of surface sampled ($\mu g/ft^2$). Additional cleaning using HEPA filtered vacuum systems and/or wet methods is recommended for these areas to help further reduce the potential for personnel exposure to lead.

- The air temperatures within the facility ranged from 78.6°F to 81.5°F, as compared to an outdoor temperature of 79.3°F. A majority of the temperatures collected inside the building exceeded what is considered comfortable, as recommended by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). These areas were occupied sporadically throughout the day of the assessment. All occupied areas assessed were ventilated by floor-mounted air condtioning units that condition outdoor air. IES was informed that the facility has a roof-top air-handling unit, but it has not worked for six years. Indoor relative humidity ranged from 42.9% to 51.4% in the facility, as compared to an outdoor level of 51.5%. These levels are within the recognized comfort range of 30 to 60%.

- The average illuminance levels in several areas throughout the facility were below the recommended values. Although the lower-than-recommended lighting levels are not expected to present an imminent hazard, safety and ergonomic improvements could result from enhanced lighting in these areas.

- All building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. IES observed all presumed asbestos-containing materials (PACM) and facility paint were in good condition. IES did not observe any mold growth, nor were there indications of mold and bacteria growth. No building materials samples were collected on the day of the survey.

- Various health and safety items were identified during the comprehensive survey. These violations included:

- Numerous fire extinguishers throughout the facility were blocked
- Emergency lights did not work when tested

1.4 Recommendations

IES' recommendations resulting from this assessment are included in a separate document entitled, are included in a separate document entitled, "Cheltenham_RC_08_Recommendations."

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2.0 OPERATION DESCRIPTION

INSTALLATION: RC Army National Guard
BUILDING: 9900 Surratts Road, Cheltenham, Maryland 20623
LOCATION: Site wide

OPERATION DESCRIPTION: On the day of the assessment, IES witnessed routine operations for the RC. Supervisors were preparing for a recruitment activity that occurred later that day at an off-site location. Training at the RC occurs once a month, a weekend at a time.

CHEMICAL AND PHYSICAL AGENTS SAMPLED: Personal and area sampling for lead was performed on the day of the assessment during what is considered routine operations when training is not taking place at the facility. General IAQ measurements were made throughout the facility to evaluate ambient conditions on the day of the assessment.

LIGHTING: The average illuminance levels in several areas throughout the shop were below the recommended values. Refer to Section 3.3 of this report for a summary of the lighting measurements.

INTERPRETATION OF RESULTS: The personal and general area lead sample results suggest that the likelihood of personnel exposure to airborne lead dust is low. Wipe samples for lead that were collected from various horizontal surfaces throughout the Readiness Center indicated that the surface lead concentrations in certain areas exceeded the recommended precautionary level of 200 $\mu g/ft^2$. Although there is limited correlation between surface lead contamination and airborne lead exposures, it is recommended that the affected areas be thoroughly cleaned using HEPA filtered vacuum systems and/or wet methods. The average illuminance levels in several areas throughout the facility were below the recommended values. Although the lower-than-recommended lighting levels are not expected to present an imminent hazard, safety and ergonomic improvements could result from enhanced lighting in these areas. A majority of temperatures within the facility exceeded the comfort levels set forth by ASHRAE. All building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. IES observed all presumed asbestos-containing materials (PACM) and facility paint were in good condition. IES did not observe any mold growth, nor were there indications of mold and bacteria growth.

3.0 SAMPLE RESULTS AND MEASUREMENTS

3.1 Air Sampling

3.1.1 Indoor Air Quality

Measurements of air temperature, relative humidity, and CO_2 and CO concentrations were made using a calibrated direct reading hand-held TSI Q-Trak Indoor Air Quality instrument. The carbon monoxide sample results were compared with the Threshold Limit Values (TLVs) for exposure assessment purposes. TLVs are established by the American Conference of Governmental Industrial Hygienists (ACGIH) and are published annually in ACGIH's *TLVs and BEIs*. They refer to airborne exposure concentrations and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. However, because of wide variations in individual susceptibility, a small percentage of workers may experience discomfort from or be affected by some substances at concentrations below the recommended threshold limit.(1)

Table 1 details the air temperature, relative humidity, CO_2, and CO measurements collected throughout the building during the assessment. Refer to the Indoor Air Quality maps in Appendix B for the IAQ measurements at each location throughout the facility.

TABLE 1
AIR TEMPERATURE, RELATIVE HUMIDITY, CO_2, AND CO MEASUREMENTS

Date of Assessment: July 25, 2008
Location: National Guard RC, Cheltenham, Maryland
Analyte(s): CO_2, CO, Temperature, and Relative Humidity
Exposure Guidelines: CO_2: Indoor CO_2 concentrations should be maintained at less than 700 ppm above outdoor air levels (ASHRAE 62.1-2007)(2)
CO: 25 ppm (ACGIH TLV-TWA)
Temperature: 68 ºF to 79 ºF (ASHRAE 55-2004)(3)
Relative Humidity: 30% to 60% (ASHRAE 55-2004)(3)

Sample ID	Sample Description	Start - End Time (hh:mm)	Sample Time	CO_2 (ppm)	CO (ppm)	Measured Temperature (ºF)	Measured Relative Humidity (%)
A	**Outdoor** - Area Sample (AS) – Approximately four feet above the ground outside of the RC.	1015 – 1019	4 Min.	350	0	79.3	51.5
B	**Assembly Hall** – AS – Approximately four feet above the floor at the center of the Assembly Hall.	1019 – 1023	4 Min.	436	0	79.8	51.4
C	**Orderly Office** – AS – Approximately four feet above the floor at the center the Orderly Office.	1023 – 1027	4 Min.	761	0	81.5	44.5
D	[redacted] **Office** – AS – Approximately four feet above the floor at the center of [redacted] Office.	1027 – 1031	4 Min.	755	0	81.4	42.9

Sample ID	Sample Description	Start - End Time (hh:mm)	Sample Time	CO_2 (ppm)	CO (ppm)	Measured Temperature (°F)	Measured Relative Humidity (%)
E	[redacted] **Office** – AS – Approximately four feet above the floor at the center of [redacted] Office.	1031 – 1035	4 Min.	713	0	81.4	42.9
F	**Kitchen** – AS – Approximately four feet above the floor at the center of kitchen.	1035 – 1039	4 Min.	802	0	78.9	43.3
G	**Hallway** – AS – Approximately four feet above the floor in the middle of Hallway 127.	1039 – 1043	4 Min.	792	0	80.2	43.3
H	**Hallway** – AS – Approximately four feet above the floor in the middle of Hallway 128.	1043 – 1047	4 Min.	788	0	80.4	43.1
I	**Hallway** – AS – Approximately four feet above the floor in the middle of Hallway 129.	1047 - 1051	4 Min.	822	0	78.6	43.1
J	**Fitness Center** - AS – Approximately four feet above the floor in the center of the Fitness Center	1051 – 1055	4 Min.	809	0	78.7	43.2

Note: - All airborne CO_2 and CO concentrations are expressed in parts of contaminant per million parts of air (ppm)

Refer to Section 6.0, Equipment and Calibration Data, for the calibration data for the equipment used to perform the IAQ survey.

3.1.2 Airborne Lead Sampling

Air samples for lead were collected with personal air sampling pumps on 0.8 µm mixed cellulose ester (MCE) filters. All sampling pumps were calibrated before and after the sampling period with a primary gas flow standard. Area samples were collected as a part of this assessment. Following the assessment, the air samples and an appropriate number of field blanks were shipped via overnight courier to AMA Analytical (AMA) in Lanham, Maryland, which is accredited by the American Industrial Hygiene Association (AIHA) for analysis and participates in the Environmental Lead Accreditation Program (ELAP). The air samples were analyzed for lead using the EPA 600/R-93/200 Flame Atomic Absorption Spectroscopy (FAAS) method. All air sample results were reported in micrograms of lead cubic per meters of air sample ($\mu g/m^3$) for the purposes of this assessment.

Air sample results for lead were compared to the Action Level and Permissible Exposure Limits (PELs) published in OSHA 1910.1025, the expanded health standard for lead. Action Levels and PELs are promulgated through the OSHA rule-making process and act as legal limits for exposure in the work place. They are intended to provide protection to employees who are potentially exposed to airborne contaminants. The Action Level for lead is expressed in terms of an 8-hour time-weighted average (TWA) contaminant concentration. The PELs for lead are expressed in terms of 8-hour TWAs. Copies of the OSHA regulations are available through the local OSHA Area Office, in the Federal Register, or on the OSHA website at *www.osha.gov*.[4]

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This report's findings are based on the lead samples collected during the assessment, which are summarized in Table 2. Refer to Appendix C for the complete laboratory air sample analysis results. Worksite Sampling Data Records are included in a separate document entitled, "Cheltenham_RC_08_Medical."

TABLE 2
AIRBORNE LEAD SAMPLING RESULTS SUMMARY

Date of Monitoring: July 25, 2008
Location: Army National Guard RC, Cheltenham, Maryland
Analyte(s): Lead
Occupational Exposure Limits: Lead: OSHA PEL-TWA = 50 µg/m^3
OSHA Action Level (TWA) = 30 µg/m^3

Sample ID	Equipment ID	Sample Description	Start Time	End Time	Sample Time (Min.)	Flow Rate (lpm)	Air Volume (l)	Measured Airborne Contaminant Concentration
072508-A001	103	**SGT** [redacted] – Personal Sample - Operator Breathing Zone (PS-OBH) – During normal operations within the Cheltenham Armory.	0705	1230	325	2.01	653.3	<4.6 µg/m^3
072508-A002	104	**SGT** [redacted] **Office** – Area Sample - Operator Breathing Zone (AS-OBH) – During normal operations within in the Readiness Center.	0705	1230	325	1.99	646.8	<4.6 µg/m^3

Note: - Sample results for lead are expressed as micrograms of contaminant per cubic meter of air (µg/m^3)
- PEL-TWA = OSHA Permissible Exposure Level, 8-Hour TWA

3.2 Lead Dust Sampling

IES performed wipe sampling in the Drill Hall, converted IFR and in select areas throughout the facility. All wipe sampling was performed in accordance with: best Industrial Hygiene practices and the guidelines published in Section II: Chapter 2, Sampling for Surface Contamination, of the OSHA Technical Manual. The wipe samples were collected over 100 square centimeter areas using pre-wetted Ghost Wipes. The wipe samples collected as a part of this assessment, along with appropriate field blanks, were shipped to AMA for analysis and were analyzed using the NIOSH 7082 flame atomic absorption spectrophotometer (FAAS) method. All wipe sample results were reported in micrograms of lead per square foot of surface sampled (µg/ft^2) for the purposes of this assessment.

This report's findings are based on the lead samples collected during the assessment, which are summarized in Table 3. Refer to Appendix D for sample locations and Appendix C for the complete laboratory wipe sample analysis results. Worksite Sampling Data Records are included in a separate document entitled, "Cheltenham_RC_08_Medical."

IES ENGINEERS

TABLE 3 – WIPE SAMPLE RESULTS SUMMARY

Date of Monitoring:	July 25, 2008
Location:	Army National Guard RC, Cheltenham, Maryland
Analyte(s):	Lead
Occupational Exposure Limits:	ARNG Recommended Cleaning Level = 200 $\mu g/ft^2$

Sample ID	Sample ID	Location	Area of Surface Sampled	Measured Lead Surface Contamination ($\mu g/cm^2$)
A	072508-SW001	**Drill Hall** -Wipe Sample (WS)- Horizontal surface of Coke Machine	100 cm^2	<110
B	072508-SW002	**Drill Hall** -WS- Horizontal surface of storage cabinet	100 cm^2	<110
C	072508-SW003	**Drill Hall** -WS- Center of Drill Hall floor surface	100 cm^2	<110
D	072508-SW004	**Kitchen** -WS-Top of Continental Refrigerator	100 cm^2	<110
E	072508-SW005	Non-Responsive **Office** -WS-Surface of file cabinet	100 cm^2	<110
F	072508-SW006	**Converted Rifle Range** -WS-Surface ventilation exhaust at entrance	100 cm^2	<110
G	072508-SW007	**Converted Rifle Range** -WS-Surface ventilation exhaust at back	100 cm^2	<110
H	072508-SW008	**Converted Rifle Range** -WS-Surface of floor at side entrance	100 cm^2	300
I	072508-SW009	**Converted Rifle Range** -WS-Surface of floor at rear stage	100 cm^2	980
J	072508-SW010	**Converted Rifle Range** -WS-Surface of hallway floor outside of range	100 cm^2	<110
K	072508-SW011	**Orderly Office** -WS-Surface of Retention file cabinet	100 cm^2	<110
L	072508-SW012	**Orderly Office** -WS-Surface of CPT Non-Respon desk	100 cm^2	<110
M	072508-SW013	**Orderly Office** -WS-Surface of refrigerator	100 cm^2	<110
N	072508-SW014	**Orderly Office** -WS-Surface of desk in SGT Non-Responsive office	100 cm^2	<110
O	072508-SW015	**Orderly Office** -WS-Surface of hallway floor outside of Orderly Office	100 cm^2	<110
P	072508-SW016	Non-Responsive **Office** -WS-Top surface of desk	100 cm^2	<110

3.3 Illuminance Survey

The illumination survey was performed pursuant to best Industrial Hygiene practices and the guidelines found in the ARNG document entitled, "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," dated November 17, 2007.[(5)] All measurements were made in slow response mode and were expressed in foot candles (fc). The measurements were used to calculate average illuminance levels for each workspace. Based on the activities conducted in each workspace, the calculated average illuminance level was compared to the ARNG recommended illuminance values. This report's findings are based on the illuminance readings collected during the survey, which are summarized in Table 4. The data reported in this table represent the average illuminance readings from the accessible locations of the commonly occupied work areas of the facility. Refer to the Illuminance Readings maps in Appendix F for sample locations.

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TABLE 4
ILLUMINANCE READINGS SUMMARY

Survey Dates: July 25, 2008
Location: Army National Guard RC, Cheltenham, Maryland

Sample ID	Sample Description	Average Illuminance Measurements (fc)	ARNG Recommended Illuminance Value (fc)
A	Assembly Hall – Center of Hall	16.2	50
B	Hallway – Center of Hallway 127	25.2	50
C	Fitness Center – Center of Center	21.0	30
D	Men's Locker Room – Center of Locker Room	15.6	7
E	Kitchen – Center of kitchen	60.1	50
F	Class Room – Center of Room	80.8	75
G	Hallway – Center of Hallway 128	25.8	30
H	Latrine – Center of latrine	23.8	7
I	Lobby – Center of Lobby	47.1	10
J	Orderly Offices – Center of Offices	48.3	50
K	SGT [redacted] Office – Center of Office	56.8	50
L	[redacted] – Center of Office	57.2	50
M	Hallway – Center of Hallway 129	34.5	30

Notes: - All illuminance measurements and recommended values are expressed in foot candles (fc)

Refer to Section 6.0, Equipment and Calibration Data, for the calibration data for the equipment used during the illumination survey.

4.0 ONSITE OBSERVATIONS

A copy of IES' field notes from this assessment is included in a separate document entitled, "Cheltenham_RC_08_Field_Notes."

4.1 Physical Condition of RC

All building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. IES observed all presumed asbestos-containing materials (PACM) and facility paint were in good condition. IES did not observe any mold growth, nor were there indications of mold and bacteria growth. No building materials samples were collected on the day of the survey.

4.2 Housekeeping

Housekeeping within the facility was generally good. IES observed no imminent slip, trip and fall hazards on the day of the assessment. All furniture within the offices and training areas were properly maintained within the rooms.

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5.0 EQUIPMENT AND CALIBRATION DATA

5.1 Sampling Equipment List

Table 5 lists the sampling equipment that was used as a part of the assessment.

TABLE 5
SAMPLING EQUIPMENT LIST

Equipment Type	Make/Model	Equipment/Serial Number	Equipment Identification
Personal Sampling Pump	MSA Escort ELF	103	103
Personal Sampling Pump	MSA Escort ELF	104	104
Primary Gas Flow Calibrator (Electronic Frictionless Piston)	Bios DryCal DC-Lite Model DCL-HM; S/N 101785	DryCal-ML	DryCal-ML
Light Meter	Extech Light Meter	401025	401025
Indoor Air Quality Monitor	TSI Model 8551 Q-Trak	51885	Q-Trak

5.2 Sampling Equipment Calibration Data

Table 6 details the calibration data for each piece of sampling equipment used during the assessment.

TABLE 6
SAMPLING EQUIPMENT CALIBRATION DATA

Equipment ID	Calibrator Used	Date of Pre-Sampling Calibration	Pre-Sampling Calibration Value (lpm)	Date of Post-Sampling Calibration	Post-Sampling Calibration Value (lpm)	Average Calibration Value (lpm)
103	DryCal-ML	7/25/08	2.01	7/25/08	2.00	2.01
104	DryCal-ML	7/25/08	1.99	7/25/08	1.99	1.99
DryCal-ML	Bench Calibrated 02/07/08	N/A	N/A	N/A	N/A	N/A
401025	NA	NA	NA	NA	NA	NA
Q-Trak	Zero Gas/ Span Gas	7/25/08	Zero Gas: 0 ppm CO_2; 0 ppm CO Span Gas 1,000 ppm CO_2; 35 ppm CO	7/25/08	Zero Gas: 0 ppm CO_2; 0 ppm CO Span Gas 1,000 ppm CO_2; 35 ppm CO	Zero Gas: 0 ppm CO_2; 0 ppm CO Span Gas 1,000 ppm CO_2; 35 ppm CO

6.0 REFERENCES

1. ACGIH, *2008 TLVs and BEIs*.
2. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), Standard 62.1-2007, "Ventilation for Acceptable Indoor Air Quality," ASHRAE, Atlanta, Georgia, 2004.
3. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), Standard 55-2004, "Thermal Environmental Conditions for Human Occupancy," ASHRAE, Atlanta, Georgia, 2004.
4. Occupational Safety and Health Administration, 29 CFR 1910.1025, Lead.
5. "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," ARNG, 17 November 2007.

APPENDIX A

FACILITY PHOTOGRAPHS

Photograph #1 – RC Exterior

Photograph #2 – Readiness Center Drill Hall

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Photograph #3 – Converted Rifle Range

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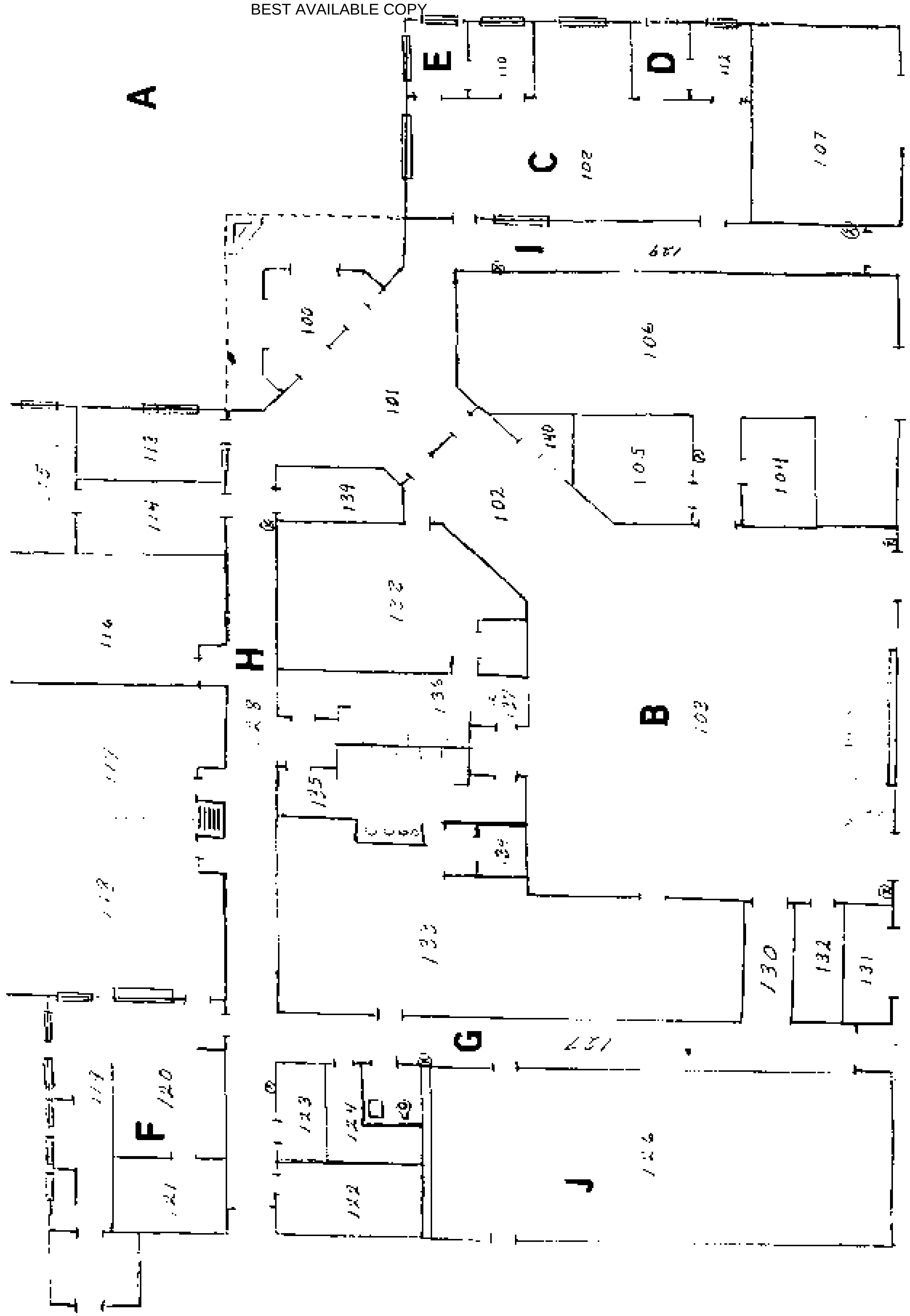
APPENDIX B

INDOOR AIR QUALITY SAMPLE LOCATION MAP

CHELTENHAM READINESS CENTER
IAQ SURVEY MAP



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APPENDIX C

AIR AND WIPE SAMPLING RESULTS

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Client: National Guard Bureau
Address: 301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation
Havre de Grace, Maryland 21078

Job Name: Not Provided
Job Location: Cheltenham, MD
Job Number: EH508749.02
P.O. Number: Not Provided

Chain Of Custody: 503006
Date Submitted: 7/29/2008
Person Submitting: [redacted]
Date Analyzed: 8/1/2008 **Report Date:** 8/1/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0874024	022508-SW001	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874025	022508-SW002	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874026	022508-SW003	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874027	022508-SW004	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874028	022508-SW005	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874029	022508-SW006	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874030	022508-SW007	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874031	022508-SW008	Flame	Wipe	****	0.108	111.52	ug/ft²		300	ug/ft²	
0874032	022508-SW009	Flame	Wipe	****	0.108	111.52	ug/ft²		980	ug/ft²	
0874033	022508-SW010	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874034	022508-SW011	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874035	022508-SW012	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874036	022508-SW013	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874037	022508-SW014	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874038	022508-SW015	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874039	022508-SW016	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874040	022508-SW017	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0874041	022508-SW018	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0874042	072508-A01	Flame	Air	653	N/A	4.59	ug/m³	<	4.6	ug/m³	

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCREDITED LABORATORY AIHA Environmental Lead See aihaiqap.org for details 100470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Not Provided	**Chain Of Custody:**	503006
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Cheltenham, MD	**Date Submitted:**	7/29/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EH508749.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	8/1/2008
				Report Date:	8/1/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments
0874043	022508-A02	Flame	Air	649	N/A	4.62 ug/m³	< 4.6 ug/m³	
0874044	022508-A03	Flame	Air Blank	0	N/A	3.00 ug/m³	< 3 ug	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)

%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these sampes.

NY ELAP accrediation applies only to paint chip, wipe, and water samples.

Analyst: Melissa Sampson

Technical Manager: G Edward Carney

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* Bill the National Guard Region North IH Office Directly

AMA Analytical Services, Inc.
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquiries) **503006**

1/2

Mailing/Billing Information:
1. Client Name: ES Engineers
2. Address 1: 1720 Walton Rd
3. Address 2: Blue Bell, PA 19422
4. Address 3:
5. Phone #: 610 828 3078 Fax #: 610 828 7842

Submittal Information:
1. Job Name:
2. Job Location: Cheltenham, MD
3. Job #: EHS08.749.02 P.O. #:
4. Contact Person: [redacted] Phone #: 610 828 3078
5. Submitted by: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day
☐ 2 Day Date Due: 8/5/08
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☐ Include COC/Field Data Sheets with Report
☒ Email: [redacted] @esengineers.com
☐ Fax:
☐ Verbal:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ______ in a 25mm 37mm
☐ NIOSH 7400 ________(QTY)
☐ Fiberglass ________(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ______ in a 25mm 37mm
☐ AHERA ________(QTY)
☐ NIOSH 7402 ________(QTY)
☐ Other (specify________) ________(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ________(QTY)
☐ EPA Point Count ________(QTY)
☐ NY State Friable 198.1 ________(QTY)
☐ Grav. Reduction ELAP 198.6 ________(QTY)
☐ Other (specify________) ________(QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ________(QTY)
☐ NY State PLM/TEM ________(QTY)
☐ Residual Ash ________(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ________(QTY)
☐ Quan. (s/area) Vacuum D5755-95 ________(QTY)
☐ Quan. (s/area) Dust D6480-99 ________(QTY)
TEM Water
☐ Qual. (pres/abs) ________(QTY)
☐ ELAP 198.2/EPA 100.2 ________(QTY)
☐ EPA 100.1 ________(QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples ______°C)

Lead Analysis
☐ Paint Chip ________(QTY)
☒ Dust Wipe (wipe type ghost wipes) 18 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid ________(QTY)
☐ TCLP ________(QTY)
☐ Drinking Water ________(QTY)
☐ Waste Water ________(QTY)
☐ Dust Wipe Furnace (wipe type ________) ________(QTY)

Mold - Direct Microscopic Analysis
☐ Spore-Trap ______(QTY) ☐ Bulk ______(QTY)
☐ Surface Swab ______(QTY) ☐ Surface Vacuum Dust ______(QTY)
☐ Surface Tape ______(QTY) ☐ Other (Specify______) ______(QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPRAY TRAP	TAPE	SWAB
072508-SW001		7/25/08		100in²				X				X				
072508-SW002								X				X				
072508-SW003								X				X				
072508-SW004								X				X				
072508-SW005								X				X				
072508-SW006								X				X				
072508-SW007								X				X				
072508-SW008								X				X				
072508-SW009								X				X				
072508-SW010								X				X				
072508-SW011								X				X				

CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 7/29/08 0930 Via: Fed Ex By (Print): Chris Nicodemus Sign: Chris Nicodemus
2. Date/Time Analyzed: ___/___/___ @ ____ By (Print): ________ Sign: ________
3. Results Reported To: ________ Via: ______ Date: ___/___/___ Time: ______ Initials: ______
4. Comments:

* Bill the National Guard Region North IH office Directly

AMA Analytical Services, Inc.
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 503506
2/2

Mailing/Billing Information:

1. Client Name: IES Engineers
2. Address 1: 1720 Walton Rd
3. Address 2: Blue Bell, PA 19422
4. Address 3:
5. Phone #: 610 828 3078 Fax #: 610 828 7842

Submittal Information:

1. Job Name:
2. Job Location: Cheltenham, MD
3. Job #: EHS08749.02 P.O. #:
4. Contact Person: [redacted] @ phone #: 610 828 3078
5. Submitted by: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
- ☐ Immediate Date Due:
- ☐ 24 Hours Time Due:
- Comments:

NORMAL BUSINESS HOURS
- ☐ Immediate
- ☐ Next Day
- ☐ 2 Day
- ☐ 3 Day
- ☒ 5 Day +
- Date Due:
- ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
- ☐ Include [redacted] with Report
- ☒ Email: [redacted] @iesengineers.com
- ☐ Fax:
- ☐ Verbals:

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
- ☐ NIOSH 7400 ____ (QTY)
- ☐ Fiberglass ____ (QTY)

TEM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
- ☐ AHERA ____ (QTY)
- ☐ NIOSH 7402 ____ (QTY)
- ☐ Other (specify ____) ____ (QTY)

PLM Bulk
- ☐ EPA 600 – Visual Estimate ____ (QTY)
- ☐ EPA Point Count ____ (QTY)
- ☐ NY State Friable 198.1 ____ (QTY)
- ☐ Grav. Reduction ELAP 198.6 ____ (QTY)
- ☐ Other (specify ____) ____ (QTY)

TEM Bulk
- ☐ ELAP 198.4/Chatfield ____ (QTY)
- ☐ NY State PLM/TEM ____ (QTY)
- ☐ Residual Ash ____ (QTY)

TEM Dust
- ☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
- ☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
- ☐ Quan. (s/area) Dust D6480-99 ____ (QTY)

TEM Water
- ☐ Qual. (pres/abs) ____ (QTY)
- ☐ ELAP 198.2/EPA 100.2 ____ (QTY)
- ☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted.
(TEM Water samples ____ °C)

Lead Analysis
- ☐ Paint Chip ____ (QTY)
- ☒ Dust Wipe (wipe type Ghost wipe) 18 (QTY)
- ☒ Air 3 (QTY)
- ☐ Soil/Solid ____ (QTY)
- ☐ TCLP ____ (QTY)
- ☐ Drinking Water ____ (QTY)
- ☐ Waste Water ____ (QTY)
- ☐ Dust Wipe Lunnace (wipe type ____) ____ (QTY)

Mold - Direct Microscopic Analysis
- ☐ Spore-Trap ____ (QTY) ☐ Bulk ____ (QTY)
- ☐ Surface Swab ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
- ☐ Surface Tape ____ (QTY) ☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
072508-SW012		7/25/08		100in²				X				X				
072508-SW013								X				X				
072508-SW014								X				X				
072508-SW015								X				X				
072508-SW016								X				X				
072508-SW017				—				X				X				
072508-SW018				—				X				X				
072508-A01			6533					X		X						
072508-A02			6488					X		X						
072508-A03			—					X		X						

CLIENT CONTACT
(LABORATORY STAFF ONLY)

Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)

1. Date/Time RCVD: __/__/__ @ ____ Via: ____ By (Print): ____ Sign: ____
2. Date/Time Analyzed: __/__/__ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: __/__/__ Time: ____ Initials: ____
4. Comments:

* Bill the National Guard Region North 1H Office Directly

SC3006

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1/2

AMA Analytical Services, Inc.
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

Mailing/Billing Information:
1. Client Name: IES Engineers
2. Address 1: 1720 Walton Rd
3. Address 2: Blue Bell, PA 19422
4. Address 3:
5. Phone #: 610 828 3078 Fax #: 610 828 7842

Submittal Information:
1. Job Name:
2. Job Location: Cheltenham, MD
3. Job #: EHS08749.02 P.O. #:
4. Contact Person [redacted] (610 828 3078
5. Submitted by: [redacted] Signature [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS			REPORT TO:
☐ Immediate Date Due:	☐ Immediate	☐ 3 Day	☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☐ Include COC/Field Data Sheets with Report
☐ 24 Hours Time Due:	☐ Next Day	☒ 5 Day +		☒ Em[redacted] @iesengineers.com
Comments:	☐ 2 Day	Date Due:		☐ Fax
				☐ Verbals:

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)

TEM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)

PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)

TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area)Dust D6480-99 ____ (QTY)

TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted.
(TEM Water samples ____ °C)

Lead Analysis
☐ Paint Chip ____ (QTY)
☒ Dust Wipe (wipe type ghost wipes) 18 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid ____ (QTY)
☐ TCLP ____ (QTY)
☐ Drinking Water ____ (QTY)
☐ Waste Water ____ (QTY)
☐ Dust Wipe Furnace (wipe type ____) ____ (QTY)

Mold - Direct Microscopic Analysis
☐ Spore-Trap ____ (QTY) ☐ Bulk ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Other (Specify ____) ____ (QTY)

CLIENT ID NUMBER	SAMPLE INFORMATION: SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	AIR	MATRIX: BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
072508-SW001		7/25/08		100in²				X				X					Date/Time: Contact: By:
072508-SW002								X				X					
072508-SW003								X				X					
072508-SW004								X				X					
072508-SW005								X				X					Date/Time: Contact: By:
072508-SW006								X				X					
072508-SW007								X				X					
072508-SW008								X				X					
072508-SW009								X				X					Date/Time: Contact: By:
072508-SW010								X				X					
072508-SW011								X				X					

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: / / @ Via: By (Print) Sign:
2. Date/Time Analyzed: / / @ By (Print) Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

* Bill the National Guard Region North IH Office Directly

AMA Analytical Services, Inc.
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CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 563006

COPY 2/2

Mailing/Billing Information:
1. Client Name: IES Engineers
2. Address 1: 1720 Walton Rd
3. Address 2: Blue Bell, PA 19422
4. Address 3: ____
5. Phone #: 610 828 3078 Fax #: 610 828 7842

Submittal Information:
1. Job Name: ____
2. Job Location: Cheltenham, MD
3. Job #: EHS08749.02 P.O. #: ____
4. Contact Person: [redacted] Phone #: 610 828 3078
5. Submitted by: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ____ ☐ 24 Hours Time Due: ____ Comments: ____	☐ Immediate ☐ 3 Day ☐ Next Day ☒ 5 Day + ☐ 2 Day Date Due: ____ ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☐ Include COC/Field Data Sheets with Report ☒ Email: [redacted] @iesengineers.com ☐ Fax: ____ ☐ Verbals: ____

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ NIOSH 7400____(QTY)
☐ Fiberglass____(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ AHERA____(QTY)
☐ NIOSH 7402____(QTY)
☐ Other (specify____)____(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate____(QTY)
☐ EPA Point Count____(QTY)
☐ NY State Friable 198.1____(QTY)
☐ Grav. Reduction ELAP 198.6____(QTY)
☐ Other (specify____)____(QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield____(QTY)
☐ NY State PLM/TEM____(QTY)
☐ Residual Ash____(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust____(QTY)
☐ Quan. (s/area) Vacuum D5755-95____(QTY)
☐ Quan. (s/area)Dust D6480-99____(QTY)
TEM Water
☐ Qual. (pres/abs)____(QTY)
☐ ELAP 198.2/EPA 100.2____(QTY)
☐ EPA 100.1____(QTY)

☐ All samples received in good condition unless otherwise noted.
(TEM Water samples ____°C)

Lead Analysis
☐ Paint Chip____(QTY)
☒ Dust Wipe (wipe type ghost wipes 18 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid____(QTY)
☐ TCLP____(QTY)
☐ Drinking Water____(QTY)
☐ Waste Water____(QTY)
☐ Dust Wipe Furnace (wipe type____)____(QTY)

Mold - Direct Microscopic Analysis
☐ Spore-Trap____(QTY) ☐ Bulk____(QTY)
☐ Surface Swab____(QTY) ☐ Surface Vacuum Dust____(QTY)
☐ Surface Tape____(QTY) ☐ Other (Specify____)____(QTY)

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
072508-SW012		7/25/08		100in²				X				X					Date/Time: Contact: By:
072508-SW013								X				X					
072508-SW014								X				X					
072508-SW015								X				X					
072508-SW016								X				X					Date/Time: Contact: By:
072508-SW017				—				X				X					
072508-SW018				—				X				X					
072508-A01			658.3					X		X							
072508-A02			646.8					X		X							Date/Time: Contact: By:
072508-A03			—					X		X							

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: ____/____/____ @ ____ Via: ____ By (Print): ____ Sign: ____
2. Date/Time Analyzed: ____/____/____ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ____/____/____ Time: ____ Initials: ____
4. Comments: ____

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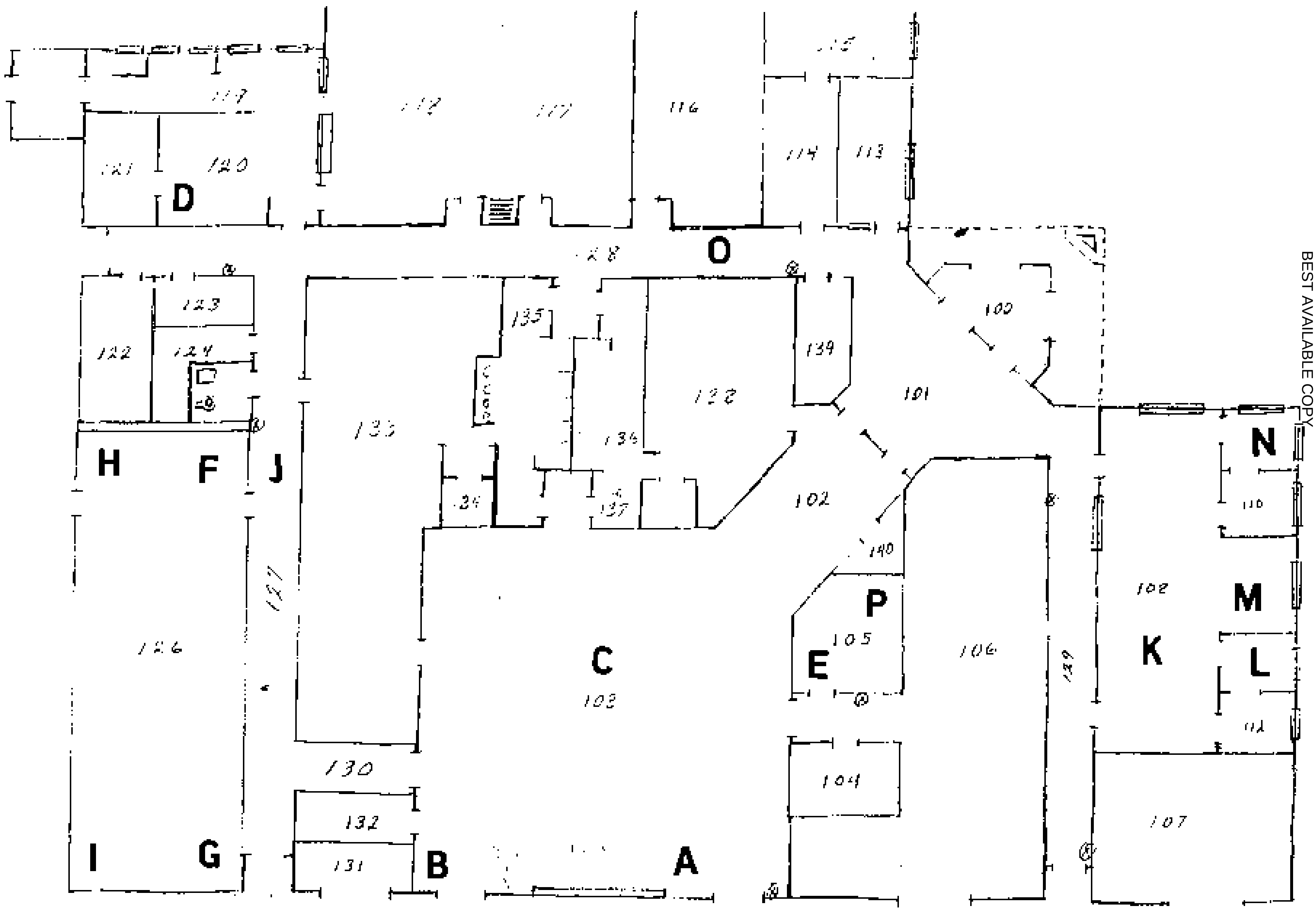
APPENDIX D

WIPE SAMPLING LOCATION MAP

CHELTENHAM READINESS CENTER
LEAD WIPE SAMPLE MAP



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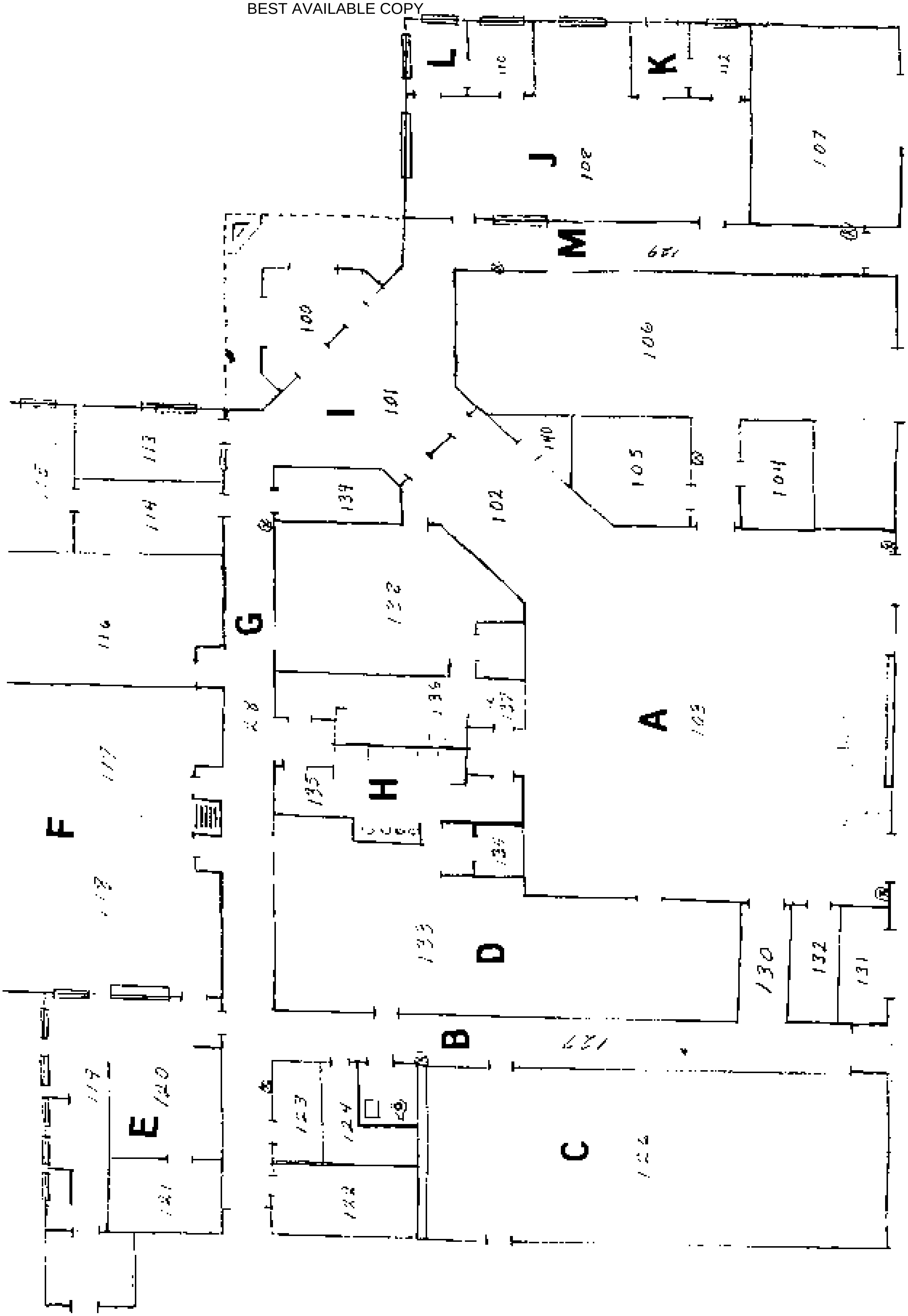
APPENDIX E

ILLUMINATION SURVEY MAP

CHELTENHAM READINESS CENTER
ILLUMINATION SURVEY MAP



ANALYTICAL LABORATORY SERVICES, INC.

Environmental ✦ Industrial Hygiene ✦ Field Services www.analyticallab.com

Industrial Hygiene Survey

National Guard Facility
Cheltenham Armory
9900 Surratts Road
Cheltenham, MD 20623

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Cheltenham Armory** **9900 Surratts Road** **Cheltenham, MD 20623**
Prepared By:	**Analytical Laboratory Services, Inc.** **3544 North Progress Avenue** **Suite 100** **Harrisburg, PA 17110**
Survey Date:	**October 7, 2010**
Report Date:	**November 8, 2010**
ALSI Project #:	**1010666**

Non-Responsive
[redacted]

Director, Environmental Health & Safety

Table of Contents

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Section 1.0
Executive Summary

Section 1.0 Executive Summary

On October 7, 2010, Analytical Laboratory Services, Inc. (ALSI) personnel Ms. [redacted] and Mr. [redacted] performed an industrial hygiene survey at the Cheltenham Armory located at 9900 Surratts Road, Cheltenham, MD 20623

1. Surface levels of lead exceeded 200 ug/ft^2 in the Men's Locker Room. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2. Peeling and damaged paint should be repaired and properly remediated.

2. Lighting within the facility was evaluated. Lighting levels met the minimum recommended guidelines in all areas but the Drill Hall. Lighting should be improved in this area.

3. Temperature levels were slightly lower than the recommended guideline in a few locations. Individual comfort due to temperature varies greatly within a population. Relative humidity, carbon dioxide (ventilation) and carbon monoxide levels were within recommended guidelines.

4. Active water leaks are present in a few areas. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

5. Return vents were dirty with some areas of possible fungal growth. Do not permit dirt, debris, microbial growth, etc. to accumulate in any portion of the HVAC system including the supply and return vents. Supply and return vents should be properly cleaned.

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Section 2.0
Operation Description & Observations

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Section 2.0 Operation Description & Observations

The Cheltenham Armory serves primarily as an office setting and equipment storage facility. The facility consists of offices, a drill hall, and storage areas. There is no garage area.

The building was initially constructed in 1996. There are eight employees. The interior walls are primarily concrete block with finished drywall in some areas. The floors were composed of a poured concrete slab with floor tile and carpeting. The ceilings were generally composed of a roof deck with a suspended drop ceiling system in some areas.

There is a central heating, ventilating, and air conditioning system (HVAC) present. At the time of this survey it was in operation but facility staff stated that it was not working properly and inaccessible for inspection. Doors and windows were open. There are unit ventilators in the offices.

There is an old firing range in the building. It has been fully abated. It is now used for gym facility.

Overall housekeeping was good.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared properly designed. Personnel had supportive chairs.

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Section 3.0
Noise Survey

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Section 3.0 Noise Survey

Employees were not performing tasks that provided excessive noise levels. Therefore, noise exposure monitoring was not conducted.

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Section 4.0
Lead Testing

Section 4.0 Lead Testing

At the time of the assessment, no activities were observed which would generate lead exposure. At one time the facility contained an indoor firing range. It is now a gym area.

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected using Ghost Wipe™ samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 um mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m³	Surface ug/ft²
1	Dill Hall	7.1	
2	Room 108	<6.8	
3	Blank	<3 (ug)	
4	Drill Hall Floor (Center)		<110
5	Drill Hall – Top of Soda Machine		<110
6	Drill Hall - Tabletop		<110
7	Room 106 - Supply Room Floor		<110
8	Room 108 - UV Grill		<110
9	Room 111 Top of Filing Cabinet		<110
10	Room 113 - Widow Sill		<110
11	Hallway Floor Outside Room 117		<110
12	Room 120 Kitchen – Top of Ceramic Wall		<110
13	Gym, Converted Firing Range – Floor		<110
14	Gym, Converted Firing Range – Exhaust Vent Fin		<110
15	Gym, Converted Firing Range - Exercise Seat		<110
16	Floor Outside Gym, Converted Firing Range		<110
17	Room 133 Men's Locker Room – Floor		**400**
18	Blank		<12 (ug)
Criteria		**50**	**200**

Key: **Bolded** results exceed listed criteria

Source: Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

Surface levels of lead exceeded 200 ug/ft^2 in the Men's Locker Room. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2. Peeling and damaged paint should be repaired and properly remediated.

The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for Environmental Chemicals," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 ug/m^3.

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Section 5.0
Lighting

Section 5.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. K070003). The light meter was last calibrated on November 26, 2009. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Room 108	122.2	30-50	Yes
Room 111	93.3	30-50	Yes
Room 113	74.0	30-50	Yes
Room 117/118	133.5	30-50	Yes
Room 120 Kitchen	111.4	50	Yes
Room 133 Men's Locker Room	63.2	7	Yes
Room 129 Gym. Converted Firing Range	75.1	30	Yes
Drill Hall	17.9	30-50	No
Room 105	75.5	30-50	Yes

Lighting levels met the minimum recommended guidelines in all but the Drill Hall. Lighting should be improved in this area.

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Section 6.0
Indoor Air Quality

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Section 6.0 Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7565X (Serial # 0839020). The IAQ Meter was last calibrated in March 2010.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2007). ASHRAE specifies temperature and relative humidity ranges for human comfort (ASHRAE 55-2004). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60% in occupied areas.

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 70.1 to 73.3 degrees F with relative humidity readings ranging from 46.6% to 52.3%. During the survey, carbon dioxide (CO_2) levels ranged from 356 ppm to 750 ppm within the facility compared to an outdoor CO_2 level of 326 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,026 ppm (326 ppm + 700 ppm). The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	64.5	55.3	328	0.0
Room 108	**71.2**	52.1	513	0.0
Room 111	72.8	51.0	750	0.1
Room 113	73.3	50.8	481	0.0
Room 117/118	73.0	49.3	396	0.0
Room 120 Kitchen	72.5	49.4	374	0.0
Room 133 Men's Locker Room	72.8	52.3	368	0.0
Room 129 Gym, Converted Firing Range	72.7	46.9	413	0.1
Drill Hall	**70.1**	46.6	356	0.0
Room 105	**71.1**	50.7	728	0.0
Outdoors	65.1	49.7	324	0.1
Criteria	**73.0-79.0**	**30-60**	**<1,026**	**<9.0**

Key: **Bolded** results were outside listed criteria

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Temperature levels were slightly lower than the recommended guideline in a few locations. Individual comfort due to temperature varies greatly within a population. Relative humidity, carbon dioxide (ventilation) and carbon monoxide levels were within recommended guidelines.

A visual inspection was conducted throughout visually accessible portions of the facility. The visual inspection was conducted to assess sources or pathways of factors potentially deleterious to IAQ. The visual inspection revealed the following items that may be potential sources of poor IAQ:

1. Room 132 – Efflorescence on the block wall. This is an indication of water infiltration.

2. Kitchen:
    - Return vents were dirty
    - Small area of chipping and peeling paint.

3. Room 117/118:
    - Missing and water stained ceiling tile.
    - Water leak present under the unit ventilator.

4. Room 105 – Current roof leak. Suspected fungal growth on ceiling tile where roof leak was present.

5. Hallway – Floor tile are loose and popping up.

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Section 7.0
Suspect Asbestos Contain Building Materials

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Section 7.0 Suspect Asbestos Containing Building Materials

No suspect asbestos containing materials (ACM) were identified. Hidden or inaccessible areas were not inspected. No samples were collected.

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Section 8.0
Maintenance Bay

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Section 8.0 Maintenance Bay

There is no garage or maintenance area at this facility.

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Section 9.0
Limitations

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Section 9.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Analytical Laboratory Services, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A
Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP 10920

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	Job Name:	Cheltenham Armory	Chain Of Custody:	508983
Address:	301-1H Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Cheltenham, MD	Date Submitted:	10/12/2010
	Hayre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	[redacted]
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	10/19/2010 Report Date: 10/19/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
1104377	1010666-1	Flame	Air	428	N/A	7	ug/m³	3.1	7.1	ug/m³	
1104378	1010666-2	Flame	Air	442	N/A	6.8	ug/m³	<3	<6.8	ug/m³	
1104379	1010666-3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1104380	1010666-4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104381	1010666-5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104382	1010666-6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104383	1010666-7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104384	1010666-8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104385	1010666-9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104386	1010666-10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104387	1010666-11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104388	1010666-12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104389	1010666-13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104390	1010666-14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104391	1010666-15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104392	1010666-16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104393	1010666-17	Flame	Wipe	****	0.108	110	ug/ft²	43	400	ug/ft²	
1104394	1010666-18	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AIHA, NVLAP, NIST, or any agency of the Federal Government.

An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Cheltenham Armory	**Chain Of Custody:**	508983
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Cheltenham, MD	**Date Submitted:**	10/12/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	10/19/2010 **Report Date:** 10/19/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)
%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these samples.
NY ELAP accreditation applies only to paint chip, wipe, and soil samples.

Analyst: Nida McGarvey

Technical Manager: G Edward Carney

OWI (410) 247-2024 159202 210 REV. 6.08

Page 1 of 2

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **508983**

p.1/2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Cheltenham Armory
2. Job Location: Cheltenham, MD
3. Job #: [redacted] P.O. #: W912K6-09-A-0003
4. Contact Person [redacted] @ phone #: (410) 942-0273
5. Submitted by: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day+ Date Due: 10/19/10
☐ Results Required By Noon (Every Attempt Will Be Made to Accommodate)

REPORT TO:
☒ Incl[redacted]s with Report
☒ Emai[redacted]@analyticallab.com
☐ Fax: [redacted]@us.army.mil
☐ Verb[redacted]@us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM __ (Qual) PLM __ (Qual) PLM/TEM __ (Quant) PLM/TEM __ (Quant)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State TLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quant. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quant. (s/area) Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)
☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 15 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
☐ Spore-Trap ____ (QTY)
☐ Surface Swab ____ (QTY)
☐ Surface Tape ____ (QTY)
☐ Other (Specify ____) ____ (QTY)
☐ Surface Vacuum Dust ____ (QTY)
☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Culturable ID Species (Media ____) ____ (QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	NOI	LEAD	HOLD	AIR	BULK	DUST	WATER	SOIL	TAPE	SWAB
1010666-1	Drill Hall	10/7	488					X		X						
1010666-2	Rm108		442					X		X						
1010666-3	Blank		0					X		X						
1010666-4	Drill Hall-Fl			100cm²				X				X				
1010666-5	Drill Hall-Soda Machine							X				X				
1010666-6	Drill Hall-Tabletop							X				X				
1010666-7	Rm106-Fl							X				X				
1010666-8	Rm108-Wv Grill							X				X				
1010666-9	Rm111-Filing Cabinet							X				X				
1010666-10	Rm113-Window Sill							X				X				
1010666-11	Hallway Fl Outside Rm117							X				X				
1010666-12	Rm120-Top of Crown Wall							X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 10/12/10 @ 1130 Via OPS By (Print): Nicole Maxwell Sign: [signature]
2. Date/Time Analyzed: / / @ By (Print): Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

Page 2 of 2

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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 508983
p. 2/2

Mailing/Billing Information:

1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
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5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:

1. Job Name: Cheltenham Armory
2. Job Location:
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Pers[redacted] @ phone #: (410) 942-0273
5. Submitted by: Signature:

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☐ 5 Day +
☐ 2 Day Date Due:
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Inclu[redacted]s with Report
☒ Email[redacted] @
☐ Fax: [redacted]@us.army.mil
☐ Verba[redacted]e@us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM __(Qual) PLM __(Quan) PLM/TEM __(Qual) PLM/TEM __(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area) Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☐ Pb Dust Wipe (wipe type ____) ____ (QTY)
☐ Pb Air ____ (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water: ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cd ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WASTE WATER	SPORE TRAP	TAPE	SWAB
1010dddo-13	Gym-CFR Fl	10/7		100cm²				X				X				
1010dddo-14	Gym-CFR Exhaust Vent Fan							X				X				
1010dddo-15	Gym-CFR Exercise Screen							X				X				
1010dddo-16	Fl Outside Gym CFR							X				X				
1010dddo-17	Rm 133- Fl							X				X				
1010dddo-18	Blank			0cm²				X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

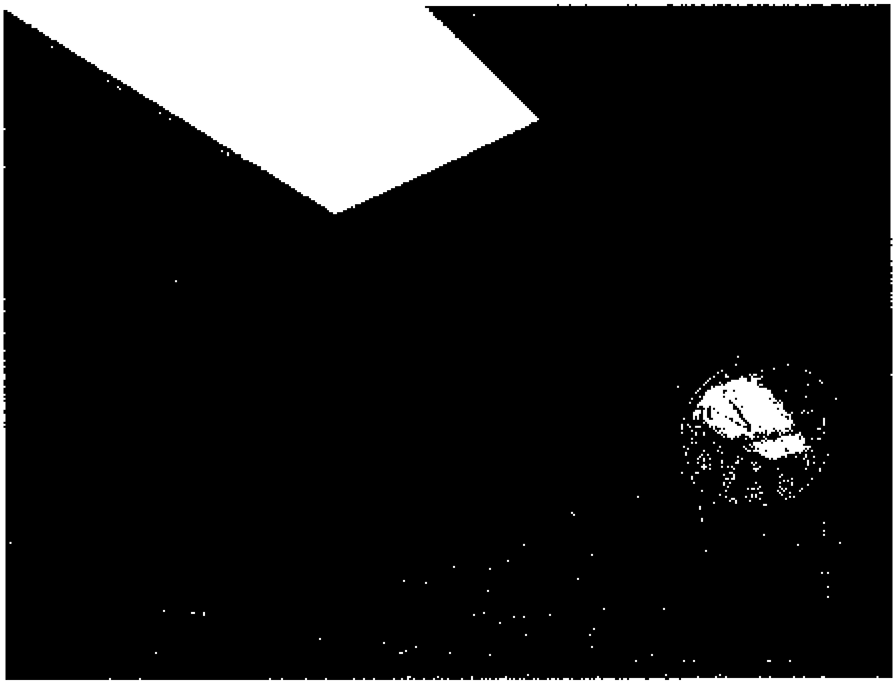
LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: / / @ Via: By (Print): Sign:
2. Date/Time Analyzed: / / @ By (Print): Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

* CFR = Converted Firing Range

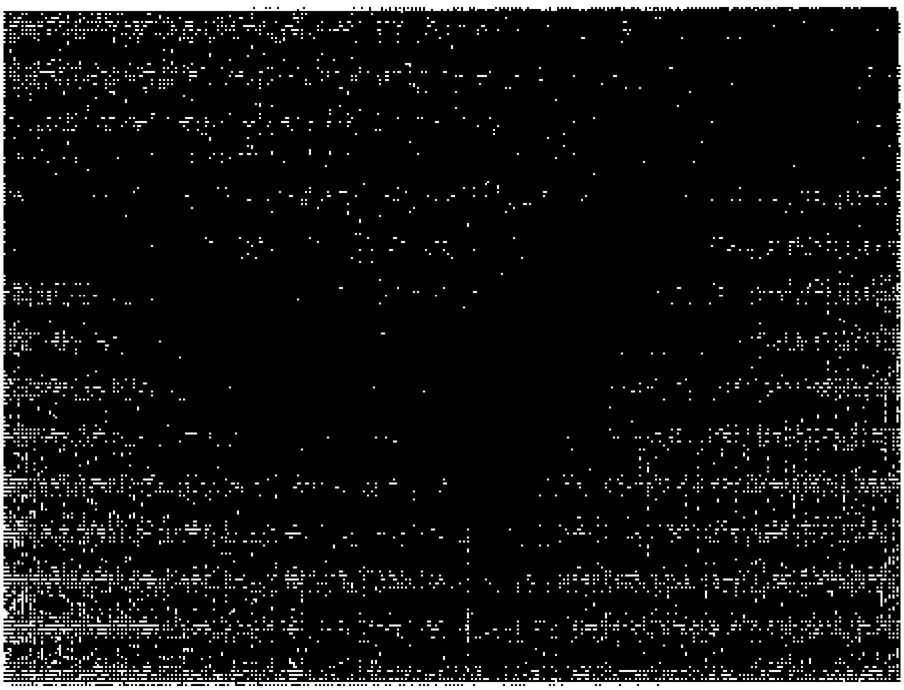
Appendix B
Photographs

Exterior

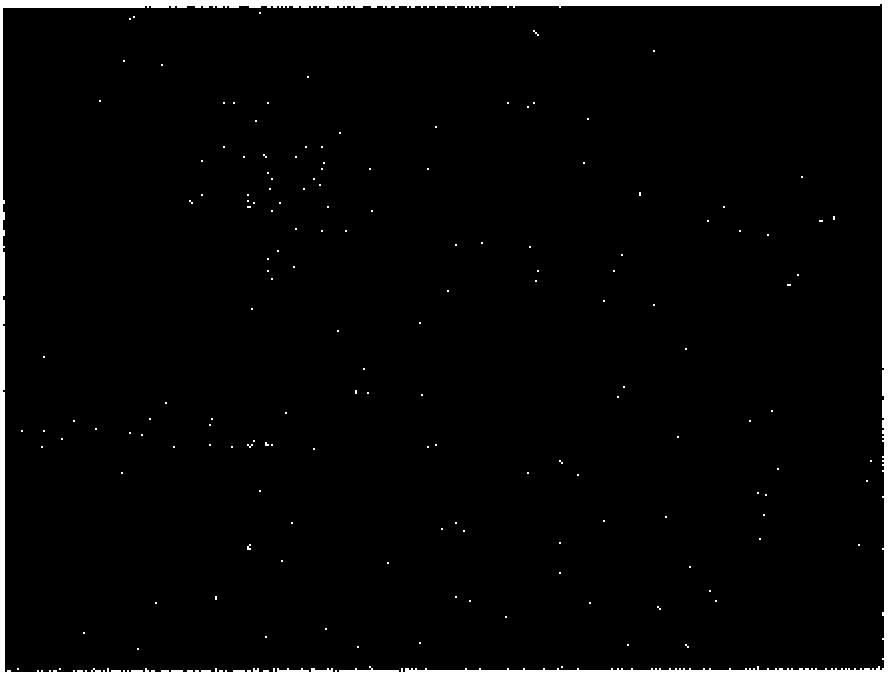
Drill Hall



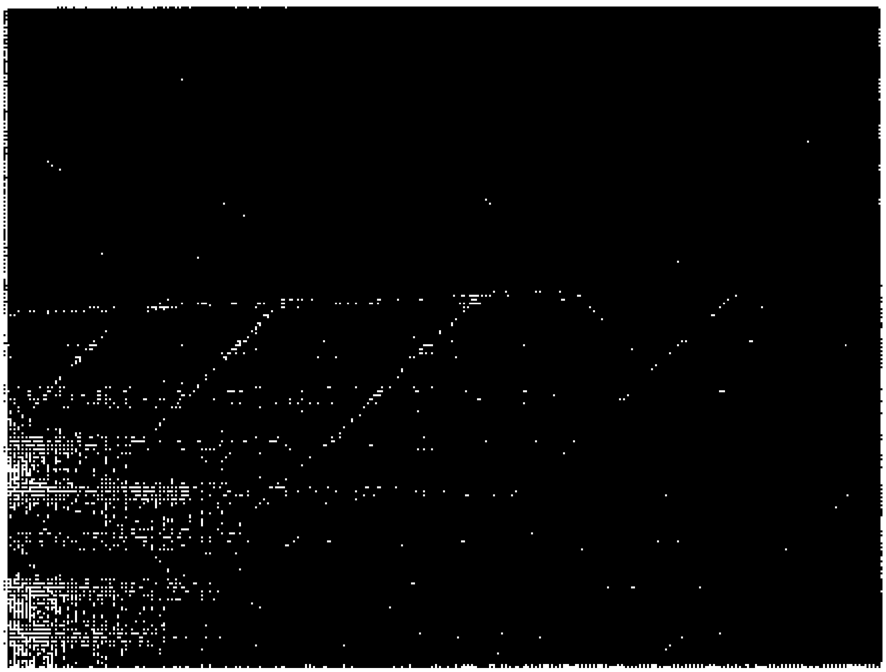
Room 105 current roof leak.



Room 105 possible fungal growth on ceiling tile.



Effloresces on block wall in drill hall, from moisture.



Loose floor tile in hallway from moisture.

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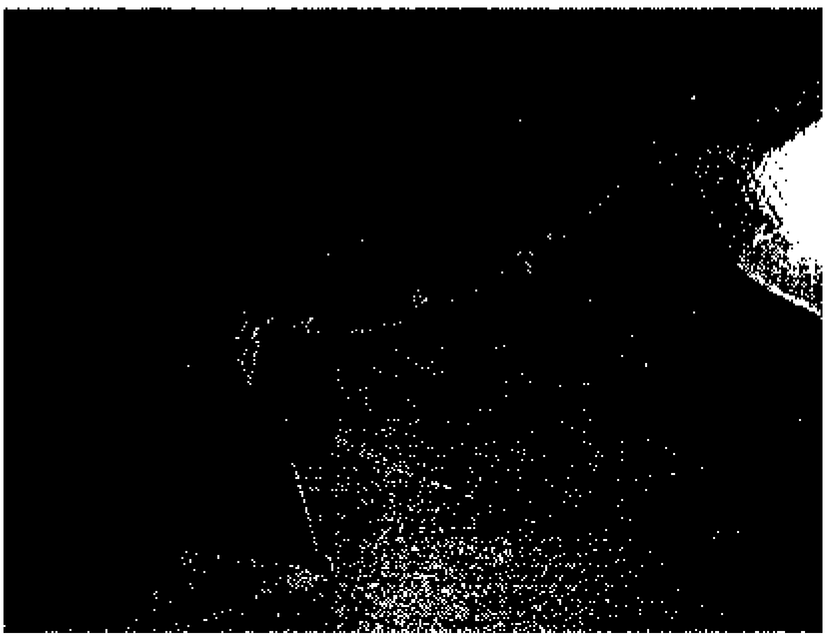
Converted firing range.



Kitchen ceiling, peeling paint from moisture.

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Room 17 and 18, moisture under floor tile a large area of floor tiles are loose with water underneath them. The source of moisture is believed to be the unit ventilator.

Boiler Room.

Appendix C
Floor Plan

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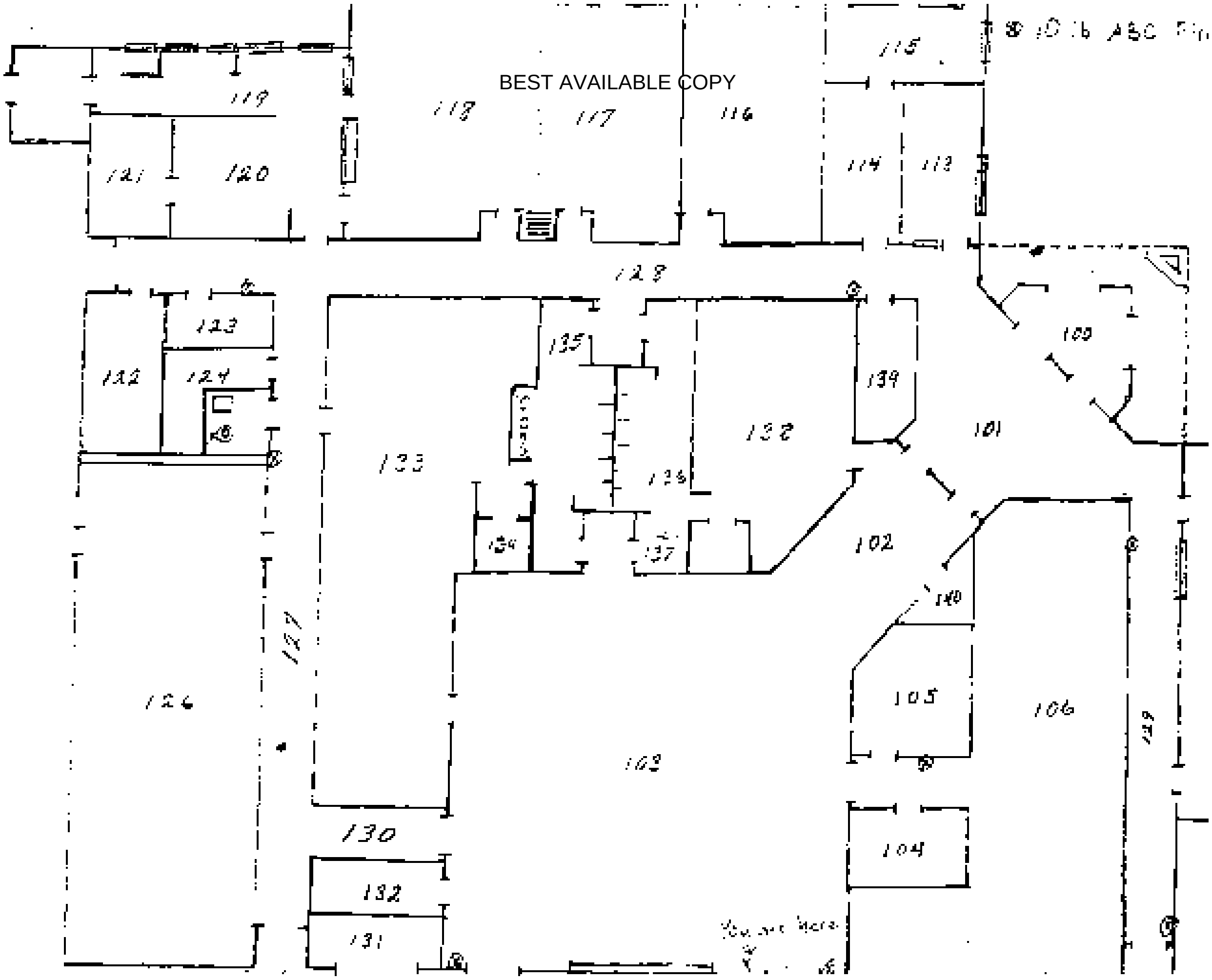

Appendix D
References

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Appendix D. References

1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration. Occupational Exposure to Lead

2. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values and Biological Exposure Indices, 2010 Edition

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 25th Edition

4. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007

5. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Thermal Environmental Conditions for Human Occupancy, 55-2004

6. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

7. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

8. National Emission Standard Hazardous Air Pollutants (NESHAP) -- The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h)(3)]

10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation

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COMPLIANCE MANAGEMENT INTERNATIONAL

1215 Manor Drive, Suite 205
Mechanicsburg, PA 17055
Phone: 717.590.7031
Fax: 717.590.7936
www.complianceplace.com

Industrial Hygiene Survey Report

National Guard Facility
Cheltenham Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Cheltenham Readiness Center** **9900 Surratts Road** **Cheltenham, MD 20623**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**October 2, 2013**
Report Date:	**November 20, 2013**

Non-Responsive [redacted]

Manager, Industrial Hygiene Services

Table of Contents

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on October 2, 2013, at the Cheltenham Readiness Center located at 9900 Surratts Road, Cheltenham, MD 20623. The survey was performed by Mr. [redacted].

1. Lead was found in the sample collected from the top of the amnesty box in the Drill Hall. See Section 3.0 for detailed sampling results.

2. Lighting levels met the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) See Section 4.0 for detailed findings.

3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.

    a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in areas sampled.

    b. The relative humidity levels met the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60%.

    c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 parts per million (ppm).

    d. Carbon dioxide (CO_2) levels met the ASHRAE 62.1-2013 recommended guidelines for mechanically ventilated office buildings and commercial settings.

    See Section 5.0 for detailed sampling results.

4. Water stained ceiling tiles were observed at a few locations.

Section 2.0 Operation Description & Observations

The Cheltenham Readiness Center is mainly an administrative facility with a drill hall, offices, and classrooms. There were 3 full-time employees stationed at this facility at the time of this survey.

The building is reported to have been built in 1987. It is a single story structure. The exterior is brick. The interior walls are block, brick, and drywall. The floors are concrete, 12”x12” floor tiles, and carpet.

The heating system is an oil-fired hot water unit. The facility has wall mounted unit ventilators for air-conditioning.

There is no child-care facility in the building.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared to be properly designed. Personnel had supportive chairs.

This facility contains a converted firing range currently being used as a weight room and simulated firing range.

No suspect asbestos containing material (ACM) was observed at the time of this survey.

No chipped and peeling paint were observed at the time of the survey.

Housekeeping is adequate.

A few water stained ceiling tiles were observed but no current roof leaks were reported.

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Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 micrometer (um) mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2
1	Drill Hall	<6.4	*
2	Converted Range/Weight Room	<6.4	*
3	Blank	<3	*
4	Drill Hall – Floor	*	<110
5	Drill Hall – Top of Amnesty Box	*	130
6	Drill Hall – Top of Computer	*	<110
7	Kitchen – Top of Food Mixer	*	<110
8	Kitchen – Top of Microwave	*	<110
9	Hallway Outside of Converted Range/Weight Room – Floor	*	<110
10	Converted Range/Weight Room - Floor	*	<110
11	Converted Range/Weight Room – Top of Exercise Equipment	*	<110
12	Dining Hall – Top of Table	*	<110
13	Room 116 Classroom – Top of TV	*	<110
14	Room 108 Office – Top of Desk	*	<110
15	Blank - Wipe	*	<12
-	**Criteria**	**50**	**200**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2 =** micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Sources:

1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges
2. OSHA 29CFR1910.1025 Lead Standard

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The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 "Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on window sills should be observed. There is no child care provided at this facility.

Lead surface and air samples were collected. The following is a summary of the sample results from this survey.

- Lead was found in the sample collected from the top of the amnesty box in the Drill Hall.

- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m^3).

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Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98082EL). The light meter was last calibrated in March 2013. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Drill Hall	16.7	10	YES
Room 132 Office	38.0	30-50	YES
Converted Range/Weight Room	70.3	30	YES
Kitchen	65.8	50	YES
Dining Room	87.4	10	YES
Room 116 Classroom	46.2	30-50	YES
Room 114 Office	99.1	30-50	YES
Room 115 Office	70.4	30-50	YES
Room 113 Office	50.1	30-50	YES
Room 108 Office	57.3	30-50	YES
Room 110 Office	163.1	30-50	YES
Room 112 Office	113.8	30-50	YES

Table Notes:
1. FC = Foot Candles
2. **Bolded** results did not meet listed criteria

Source: ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

The lighting levels met the minimum recommended guideline in all of the areas tested.

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Section 5.0 Indoor Air Quality

Survey measurements were made for comfort parameters and ventilation (temperature, relative humidity, carbon dioxide, and carbon monoxide). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7575-X (Serial #7575X1228014). The IAQ Meter was last calibrated in May 2013.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2013). ASHRAE specifies temperature ranges for human comfort (ASHRAE 55-2010). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60%.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Room 110 Office	76.8	46.8	522	0.0
Room 114 Office	76.2	59.1	524	0.0
Outdoors	83.6	48.3	419	0.0
Criteria	**68-79**	**30-60**	**<1,119**	**<9**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **°F =** degrees Fahrenheit

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2013, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements met the recommended 68-79°F in all occupied areas.

- Relative humidity levels met the recommended guideline of 30 – 60 % in all areas sampled.

- Carbon dioxide levels were measured to evaluate building ventilation or the introduction of outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level. For this survey, carbon dioxide levels did not exceed the recommended ceiling of

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1,119 ppm (700 ppm + 419 ppm). This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide

- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. The following observation were noted:

  1. Water-damaged ceiling tiles were observed in the facility. Areas above the water stain should be investigated for the source of water infiltration.

Section 6.0 Suspect Asbestos Containing Building Materials (ACM)

There was no suspect asbestos containing material (ACM) noted at the time of this survey.

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

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Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228014	3/2013	NA
Cal Light 400 Light Meter	98082EL	3/2013	NA
SKC Air Sampling Pump	767926	10/2/13	2.6 LPM
SKC Air Sampling Pump	798129	10/2/13	2.6 LPM

Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A. Laboratory Analysis Report

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org
LAB #100470

Client:	National Guard Bureau	**Job Name:**	ARNG MD	**Chain Of Custody:**	516883
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Cheltenham RC	**Date Submitted:**	10/7/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	10/25/2013
Attention:	[redacted]			**Report Date:**	10/28/2013

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
14001612	1	Flame	Air	468	N/A	6.4	ug/m³	<3	<6.4	ug/m³	
14001613	2	Flame	Air	468	N/A	6.4	ug/m³	<3	<6.4	ug/m³	
14001614	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
14001615	4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001616	5	Flame	Wipe	****	0.108	110	ug/ft²	14	130	ug/ft²	
14001617	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001618	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001619	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001620	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001621	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001622	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001623	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001624	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001625	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001626	15	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY
INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org
LAB #100470

Client:	National Guard Bureau	**Job Name:**	ARNG MD	**Chain Of Custody:**	516883
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Cheltenham RC	**Date Submitted:**	10/7/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	10/25/2013 **Report Date:** 10/28/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)

%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: [redacted]

Technical Manager: [redacted]

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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 516883

1/2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: ARNG. MD
2. Job Location: Cheltenham. RC
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person Non-Responsive [redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted] Signature: Non-Responsive [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day + 10/14/13
☐ 2 Day Date Due:
☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ Email: Non-Responsive [redacted] @ Compliance place.com
☐ Fax: [redacted] @us.army.mil
☐ Verbal [redacted] @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area)Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 12 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1	Drill Hall	10/2	468					X		X						
2	Converted Range		468					X		X						
3	Blank		0					X		X						
4	Drill Hall - floor			100 cm²				X				X				
5	Drill Hall Ammo/Box							X				X				
6	Drill Hall - computer							X				X				
7	Kitchen - food mixer							X				X				
8	Kitchen - microwave							X				X				
9	Hallway outside Range							X				X				
10	Range - floor							X				X				
11	Range - Exercise Equip							X				X				
12	Dining - Hall - Table							X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 10 / 7 / 13 @ 830 Via: FedEx By (Print): NRM Sign:
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): Sign:
3. Results Reported To: ____ Via: ____ Date: ____ / ____ / ____ Time: ____ Initials:
4. Comments:

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CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 516883

2|2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: ARNG - MD
2. Job Location: Reisterstown - RC
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person [redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day +
☐ 2 Day Date Due:
☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

REPORT TO:
☒ Include [redacted] with Report
☒ Email [redacted] @ Compliance-place.com
☐ Fax: [redacted] @us.army.mil
☐ Verb [redacted] @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area)Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 12 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

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Collection Media
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13 Rm. 116	TV	10-2		100 cm²				X				X				
14 Rm 108	Desk	↓		↓				X				X				
15 Blank		↓		0				X				X				

CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: ___/___/___ @ ___ Via: ___ By (Print): ___ Sign:
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ___ Sign:
3. Results Reported To: ___ Via: ___ Date: ___/___/___ Time: ___ Initials:
4. Comments:

Appendix B. Photographs

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Exterior of facility

Drill Hall

Converted firing range/weight room

Appendix C. Floor Plan

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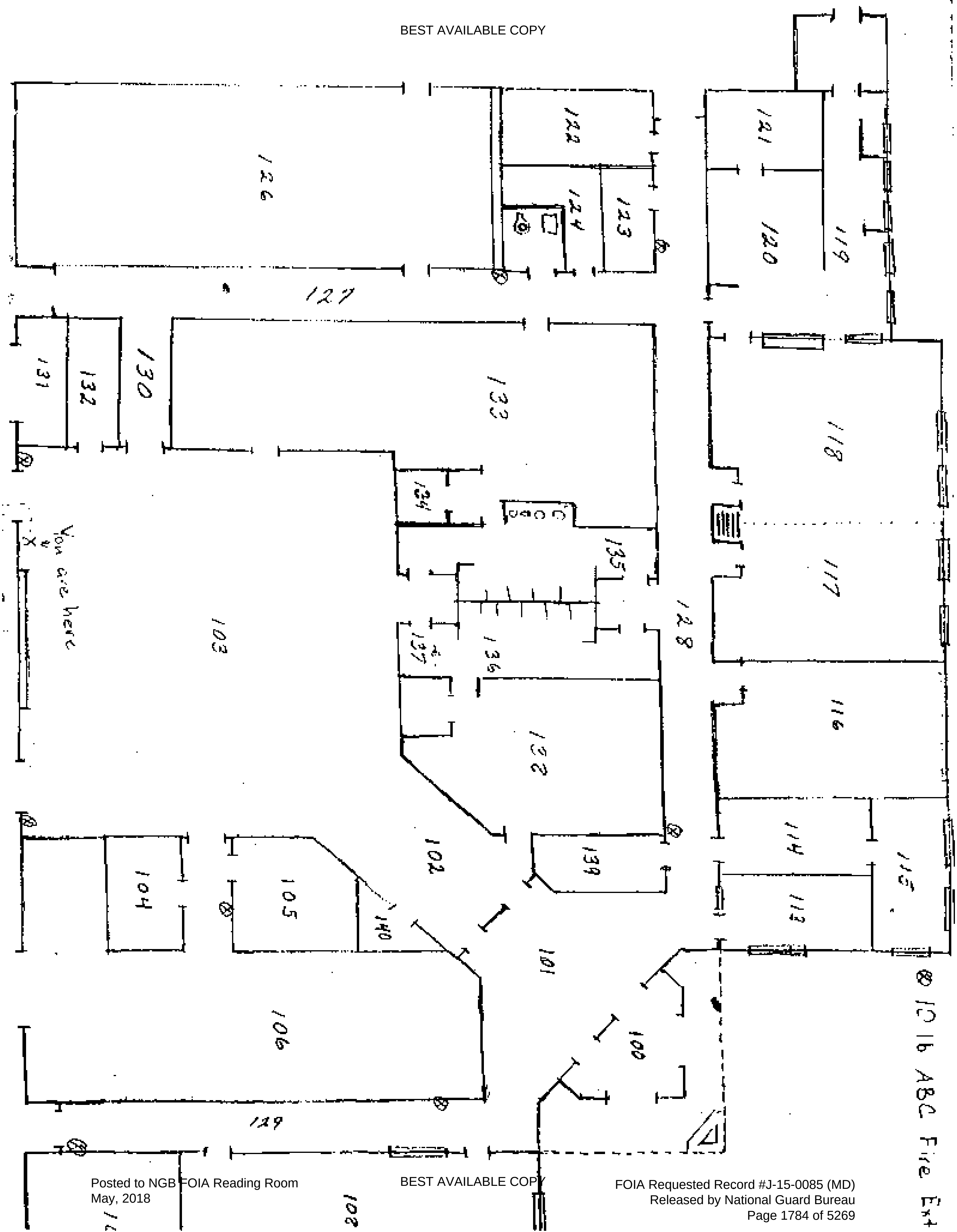

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113
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129
108
10 lb ABC Fire Ext

Appendix D. References

1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead.

2. American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2013 Edition.

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 28th Edition.

4. American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2013.

5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.

6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.

7. National Emission Standard Hazardous Air Pollutants (NESHAP) – The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

8. National Ambient Air Quality Standards (NAAQS) - National primary ambient air quality standards for carbon monoxide 40 CFR 50.8.

9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227 (h) (3)].

10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM).

11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.

12. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.

13. ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

REPLY TO
ATTENTION OF

MCHB-TS-OFS May 2004

MEMORANDUM FOR Army National Guard Bureau (NGB) Region North Industrial Hygiene NGB-AVS-SI-[redacted], 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03 SGT. MG (MD) Maurice D. Tawes Armory, Crisfield, MD

1. Enclosed is a copy of subject report and one CD-ROM.

2. Please direct any additional comments or concerns to Ms. [redacted], at DSN 584-5475/3118, commercial (410) 436-5475/3118 or e-mail address at [redacted]t@apg.amedd.army.mil.

ENCL

[redacted]
Industrial Hygienist
Industrial Hygiene Field Services Program

Readiness thru Health
Printed on Recycled Paper

U.S. Army Center for Health Promotion and Preventive Medicine

USACHPPM

MDARNG FACILITIES IH BASELINE SURVEY
MG (MD) MAURICE D TAWES ARMORY
CRISFIELD, MD
55-ML-01ED-03

Approved for public release; distribution unlimited.

CHPPM FORM 432-E (MCHB-CS-IPD), OCT 03

Readiness Thru Health

U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed $3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- ♦ *Integrity is the foundation*
- ♦ *Excellence is the standard*
- ♦ *Customer satisfaction is the focus*
- ♦ *Its people are the most valued resource*
- ♦ *Continuous quality improvement is its pathway*

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

CHPPM FORM 433-E (MCHB-CS-IPD), OCT 03 *(reverse)*

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS, MG (MD) MAURICE D. TAWES ARMORY CRISFIELD, MD PROJECT NO. 55-ML-01ED-03

1. PURPOSE OF EVALUATION. To conduct surveys at Army National Guard (ARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions at ARNG facilities. The survey will serve to establish a baseline so that a worker's history of exposures is provided for each civilian or military employee.

2. CONCLUSIONS.

a. Indoor Air Quality. The building meets the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) recommended guidelines for air quality for relative humidity. To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room should not exceed 700 parts per million (ppm) more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. The indoor temperature of 84.9 degrees Fahrenheit exceeded the recommended ASHRAE indoor air quality guidelines for an acceptable thermal environment.

b. Illumination. All areas appeared to be adequately lit and occupants reported no areas of deficient lighting. The lighting met the Illumination Engineering Society of North America Guidelines.

c. Lead. All air sample results were below the laboratory analytical detection limits for lead in air and the Occupational Safety and Health Administration (OSHA) standard. All dust-lead wipe sample results were below both the USACHPPM recommended decontamination level for dust-lead on frequently contacted surfaces, as well as the EPA exposure standards for children.

d. Water Damage. The Armory has water damage from a leaking roof. The damage is located in the mechanical room where it has been cleaned up and the roof temporarily repaired. Two rooms located over the stage in the drill hall are closed off and can not be used until the leak in the roof is repaired.

e. Industrial Hygiene and Safety Programs. There are no HAZCOM or Respiratory Protection Programs for the full time state workers who oversee the armory.

Readiness thru Health
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EXSUM, MDARNG Facilities IH Baseline Surveys, MG (MD) Maurice D. Tawes Armory, Crisfield, MD Project No. 55-ML-01ED-03

3. RECOMMENDATIONS.

The Department of Defense Risk Assessment Codes (RAC) for Health Hazards enables one to prioritize remedial action for hazards. Risk Assessments Codes range in magnitude from1 to 5, with 1 being the highest priority.

a. Indoor Air Quality. The RACs for Indoor Air Quality (Thermal Environmental Conditions) is classified as 5. Install more air conditioning units or fans to cool the armory to between 73-79 degrees Fahrenheit in the summer. The temperature in the winter should be between 68-74.5 degrees Fahrenheit. To alleviate occupant discomfort and odor control ASHRAE guidelines recommend that the carbon dioxide concentration in the room should not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. Check the ventilation system and ensure that the proper level of outdoor air is supplied.

b. The RAC for this armory for Lead Exposure is classified as 5. Clean all areas in and adjacent to the locker room (old IFR) where sampling results showed some lead residue. Apply a sealant to the area. Comprehensive guidelines are in Appendix F. This action should be accomplished before allowing children into the area. Test drinking water from water fountains and faucets for lead.

c. Water Damage. Fix the leaking roof.

d. Industrial Hygiene and Safety Programs. Provide HAZCOM and Respiratory Protection Programs for the full time state workers who oversee the armory.

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MDARNG Facilities IH Baseline Surveys MG (MD) Maurice D Tawes Armory, Crisfield, MD
Project No. 55-ML-01ED-03

TABLE OF CONTENTS

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

REPLY TO
ATTENTION OF

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03

LOCATION: MG (MD) Maurice D. Tawes Armory, Crisfield, MD

1. AUTHORITY. E-Mail dated 28 February 2003 from Ms [redacted], Industrial Hygienist, MD Army National Guard, to the USACHPPM Industrial Hygiene Field Services Program.

2. PURPOSE OF EVALUATION. To conduct surveys at Army National Guard (ARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions at ARNG facilities. The survey will serve to establish a baseline so that a worker's history of exposures is provided for each civilian or military employee.

3. BACKGROUND INFORMATION.

a. Armory Mission. Engineering Support to the 229th Transportation Company.

b. Date of Construction. 1928. The armory was rehabilitated in 1979.

c. POC. Mr. [redacted] (410-968-0378).

d. Survey Date. 4 September 2003.

4. SUMMARY OF ACTIONS.

a. Sampling. Surface dust-lead wipe and lead in air sampling was conducted to determine the existence of lead-based paint and/or lead-based paint hazards (paint-lead hazards). Carbon dioxide, temperature, and humidity measurements were collected to determine indoor air quality. Lighting conditions were measured. Sample results are in Appendix D.

b. Physical Condition of Facilities.

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03

LOCATION: MG (MD) Maurice D. Tawes Armory, Crisfield, MD

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a. Sampling. Surface dust-lead wipe and lead in air sampling was conducted to determine the existence of lead-based paint and/or lead-based paint hazards (paint-lead hazards). Carbon dioxide, temperature, and humidity measurements were collected to determine indoor air quality. Lighting conditions were measured. Sample results are in Appendix D.

b. Physical Condition of Facilities.

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(1) Paint. The paint condition is intact. Sergeant Ruth McCuen, Environmental Compliance Assessment Coordinator for the MD NGB, stated that there are no records of lead-based paint abatement.

(2) Asbestos. Staff Sergeant McCuen stated that there are no records of an asbestos abatement. No asbestos was observed.

(3) Mold. No mold was observed.

(4) Safety Hazards. No safety hazards were observed.

c. Other Building Issues.

In general the building is in good repair and the paint is intact. The Armory does have some water damage from a leaking roof. The damage is located in the mechanical room where it has been cleaned up and the roof temporarily repaired. Two rooms located over the stage in the drill hall are closed off and can not be used until the leak in the roof is repaired.

d. Safety and Industrial Hygiene Programs. There are no written program records at the armory. There is no HAZCOM Program for the full time state workers who oversee the armory. They do have PPE but no PPE program.

e. Heating, Ventilation, and Air-conditioning System. The armory has a forced air heating system. The system was not operating during this survey. Ventilation is normally provided by window-mounted air conditioning units and the manual operation of windows when the building is not being heated.

f. Noise Dosimetry. No operation that could produce hazardous noise levels was identified.

g. Lighting. Lighting was measured in fourteen locations. All lighting measurements were taken during storm conditions so there was limited outdoor lighting. Some measurements were taken with the lights off, because the rooms are normally used with the lights off.

h. Converted indoor firing range (IFR). Staff Sergeant [redacted] Environmental Compliance Assessment Coordinator for the MD NGB, stated there are no records of lead having been abated from the indoor firing range during its conversion. The IFR was converted to a locker room and gym as a self-help project about 13 years ago.

i. Photographs (Appendix C).

j. Site Maps. (Appendix B).

k. Facility use by children. The POC stated that the armory is currently used only by the units family support groups which includes children (the unit is deployed overseas) but it has been used extensively by the community and has wide-ranging use by children.

5. ASSESSMENT CRITERIA FOR LEAD. (Appendix A).

6. SAMPLING RESULTS.

a. Lead. Lead in air, surface dust-lead wipe, and indoor air quality sample results are in Appendix D. All air sample results were below the laboratory analytical detection limits of 3.0 to 15.0 μ/m^3 lead in air. This is well below the standard of 50 $\mu g/m^3$ lead in air. All dust-lead wipe sample results were below the laboratory analytical detection limits of 0.3 $\mu g/ft^2$, below the standards of 40-200 $\mu g/ft^2$.

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MDARNG Facilities IH Baseline Surveys MG (MD) Maurice D Tawes Armory, Crisfield, MD
Project No. 55-ML-01ED-03

Table 1 Lead Dust Wipe and Air Sample Results

Sample Numbers	Type of Sample	Location	Floor	Photos	Results
CR W01	Wipe	Locker room (former firing range), floor by cage (trap area)	Basement	0993	31 µg/ft²
CR W02	Wipe	Locker Room, floor, middle of room	Basement	0994	13 µg/ft²
CR W03	Wipe	Locker Room, floor, gym area	Basement	0996	5.6 µg/ft²
CR W04	Wipe	Supply Office, shelves, wall	Basement	0997	4.1 µg/ft²
CR W05	Wipe	Kitchen, table top, near far wall	Basement	0998	9.2 µg/ft²
CR W06	Wipe	Mechanical Room, floor near back wall	Second	0999	10 µg/ft²
CR W07	Wipe	State's Office, desk top	Second	1000	4.6 µg/ft²
CR W08	Wipe	Commander's Office, windowsill, middle of front wall.	Second	1002	17 µg/ft²
CR W09	Wipe	Recruiter's Office, floor, near window wall	Second	1003	7.9 µg/ft²
CR W10	Wipe	Ops/Readiness Office, desk top	First	1004	3.8 µg/ft²
CR W11	Wipe	Personnel Office, table top near window wall	First	1005	3.3 µg/ft²
CR W12	Wipe	Personnel Office, floor, near Ops wall	First	1006	6.9 µg/ft²
CR W13	Wipe	Copy/break room, desk top	First	1007	17 µg/ft²
CR W14	Wipe	Drill Hall, floor, center court	First	1008	7.6 µg/ft²
CR W15	Wipe	Drill Hall, floor of stage	First	1009	4.3 µg/ft²
40903RR10	Air	State's Office	Second	1001	< 15 mg/m³
40903RR11	Air	Locker/Gym Room	Basement	0996	< 15 mg/m³

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b. Indoor Air Quality. The relative humidity was within normal ranges. The indoor temperature of 84.9 degrees Fahrenheit exceeded the recommended ASHRAE indoor air quality guidelines for an acceptable thermal environment. Install more air conditioning units or fans in occupied rooms to cool the armory to between 73-79 degrees Fahrenheit in the summer. The temperature in the winter should be between 68-74.5 degrees Fahrenheit.

The indoor carbon dioxide levels ranged from 410- 2353 ppm. (See Table 2). To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room should not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm.

Table 2. Indoor Air Quality

Class room	Basement	1060 parts per million (ppm) CO_2
Maintenance shop (lawn equipments)	Basement	2353 ppm
Pump Room	Basement	931 ppm
Locker Room and Gym	Basement	736 ppm
Supply Office	Basement	584 ppm
Library Room	Basement	410 ppm
Kitchen	Basement	394 ppm
Drill Floor	First	687 ppm
Copy and Break Room	First	432 ppm
Lounge	First	547 ppm
Personnel Office	First	547 ppm
Ops/Readiness Office	First	534 ppm
State’s Office	Second	708 ppm
Commander’s Office	Second	711 ppm
Mechanical Room	Second	508 ppm
Outdoor		350 ppm

c. Illumination. All lighting measurements were taken during storm conditions so there was limited outdoor lighting. Some measurements were taken with the lights off, because the rooms are normally used with the lights off. Even with the lights off, most measurements were within or near the ASHRAE Guidelines.

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Project No. 55-ML-01ED-03

Table 3 Lighting Measurements

Location	Floor	Measurement	Guidelines
Locker/Gym Room	Basement	7.30 Foot Candles (FC)	10FC
Supply Office	Basement	46.5 FC	20-50 FC
Kitchen	Basement	35.0 FC	50 FC
Class Room	Basement	19.6 FC	50 FC
Mechanical Room	Second	20.0 FC	20-50 FC
State's Office	Second	86.3 FC	20-50 FC
Commander's Office	Second	86.3 FC	20-50 FC
Recruiter's Office	Second	16.4 FC (no over head lights)	20-50 FC
Ops/Readiness Office	First	37.7 FC	50 FC
Personnel Office	First	39.5 FC	20-50 FC
Copy/Break Room	First	29.0 FC	20 FC
Drill Floor	First	1.64 FC (no lights)	10 FC
Drill Floor Stage	First	1.28 FC (no lights)	10 FC
Lounge	First	25.5 FC	10-20 FC

7. DISCUSSION AND CONCLUSIONS.

a. Indoor Air Quality. The armory relative humidity of 68.5% was within the ASHRAE recommended guidelines for air quality. The indoor temperature of 84.9 degrees Fahrenheit exceeds the recommended ASHRAE guidelines. ASHRAE standards for an acceptable thermal environment are between 73-79 degrees Fahrenheit in the summer and between 68-74.5 degrees Fahrenheit in the winter. The indoor carbon dioxide levels ranged from 410- 2353 ppm. To alleviate occupant discomfort and odor control ASHRAE recommends that the carbon dioxide concentration in a room not exceed 700 ppm more than the outdoor carbon dioxide concentration.

b. Illumination. All areas appeared to be adequately lit and occupants reported no areas of deficient lighting. The lighting met the Illumination Engineering Society of North America Guidelines.

c. Building Issues. The Armory has water damage from a leaking roof. The damage is located in the mechanical room where it has been cleaned up and the roof temporarily repaired. Two rooms located over the stage in the drill hall are closed off and can not be used until the leak in the roof is repaired.

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d. Lead. All air sample results are below the laboratory analytical detection limit for lead in air of 3.0 to 15.0 µg/m³. This is below the Occupational Health and Safety Administration (OSHA) standard of 50 µg/m³. All dust-lead wipe sample results were below the USACHPPM recommended decontamination level of 200 µg/ft² for dust-lead on frequently contacted surfaces. These wipe samples did not exceed the EPA lead exposure levels for children. However, the sample taken in the locker room (former firing range) floor by the cage (trap area) in the basement showed a level of 31 µg/ft², close to the EPA exposure standard of 40 µg/ft² for children for dust-lead on floors. AR 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them. Although this facility complies with EPA and Army regulations, recleaning and sealing the locker room may further prevent exposures for children under six and for the general workforce.

8. RECOMMENDATIONS. Enclosure.

9. ADDITIONAL ASSISTANCE. For additional assistance, or questions concerning this report, please contact the undersigned at DSN 584-3118, commercial 410-436-3118, or by e-ma[redacted]@apg.amedd.army.mil.

[redacted]
INDUSTRIAL HYGIENIST
USACHPPM LEAD AND ASBESTOS TEAM LEADER
Industrial Hygiene Field Services Program
EPA AHERA Asbestos Inspector and Management Planner/
Certification Number MD-070340
EPA Lead Inspector and Lead Risk Assessor/
Certification Number 04-7913

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ENCLOSURE

CRISFIELD ARMORY RECOMMENDATIONS

The Department of Defense Instruction Number (DODI) 6055.1 provides Risk Assessment Codes (RAC) for Health Hazards, a procedure which allows us to assess the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and combines the hazard severity and accident probability into a single numeral. RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority. The RAC for this armory for Lead Exposure is classified as 5. The RAC for Indoor Air Quality is 5.

1. Lead Exposure.

a. Clean all areas in and adjacent to the former firing range rooms where sampling results showed some lead residue. Apply a sealant to the area. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. This action should be accomplished before allowing children into the area. RAC 5.

b. Test drinking water from water fountains and faucets for lead. It could not be determined if this has been done.

2. Indoor Air Quality. Thermal Comfort (Temperature).

a. Install more air conditioning units or fans to cool the armory to between 73-79 degrees Fahrenheit in the summer. The temperature in the winter should be between 68-74.5 degrees Fahrenheit. The indoor temperature of 84.9 degrees Fahrenheit exceeds the ASHRAE recommended guidelines for an acceptable thermal environment.

b. Check the ventilation system and ensure that the proper level of outdoor air is supplied. The indoor carbon dioxide levels ranged from 410- 2353 ppm. To alleviate occupant discomfort and to dilute odors and other pollutants ASHRAE recommends that the carbon dioxide concentration in the room should not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. RAC 5.

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3. Water Damage.

Repair the leaking roof. The Armory has water damage from a leaking roof. The damage is located in the mechanical room where it has been cleaned up and the roof temporarily repaired. Two rooms located over the stage in the drill hall are closed off and can not be used until the leak in the roof is repaired. RAC 5.

4. Additional Recommendations. Provide HAZCOM and Respiratory Protection Programs for the full time state workers who oversee the armory.

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APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

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Subject: Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 $\mu g/ft^2$. This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. EPA standards (40 CFR 745.227(e)(8)(viii))are not directly applicable because they are developed for floors (40 $\mu g/ft^2$), windowsills (250 $\mu g/ft^2$) and window troughs (400 $\mu g/ft^2$) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. OSHA has no specific requirement for work area surfaces. The lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. OSHA used to cite a level of 200 $\mu g/ft^2$ in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 $\mu g/ft^2$ is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels above these recommendations do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All states will receive this guidance when it is completed.

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m^3 averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

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APPENDIX B

SITE MAPS

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Project No. 55-ML-01ED-03

APPENDIX C

PHOTOGRAPHS

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Photo Location	Room Number	Photo Number
Locker room (former firing range), floor by cage (trap area)	Basement	0993
Locker Room, floor, middle of room	Basement	0994
Locker Room, floor, gym area	Basement	0996
Supply Office, shelves, wall	Basement	0997
Kitchen, table top, near far wall	Basement	0998
Mechanical Room, floor near back wall	Second	0999
State's Office, desk top	Second	1000
Commander's Office, windowsill, middle of front wall.	Second	1002
Recruiter's Office, floor, near window wall	Second	1003
Ops/Readiness Office, desk top	First	1004
Personnel Office, table top near window wall	First	1005
Personnel Office, floor, near Ops wall	First	1006
Copy/break room, desk top	First	1007
Drill Hall, floor, center court	First	1008
Drill Hall, floor of stage	First	1009
State's Office	Second	1001
Locker/Gym Room	Basement	0996

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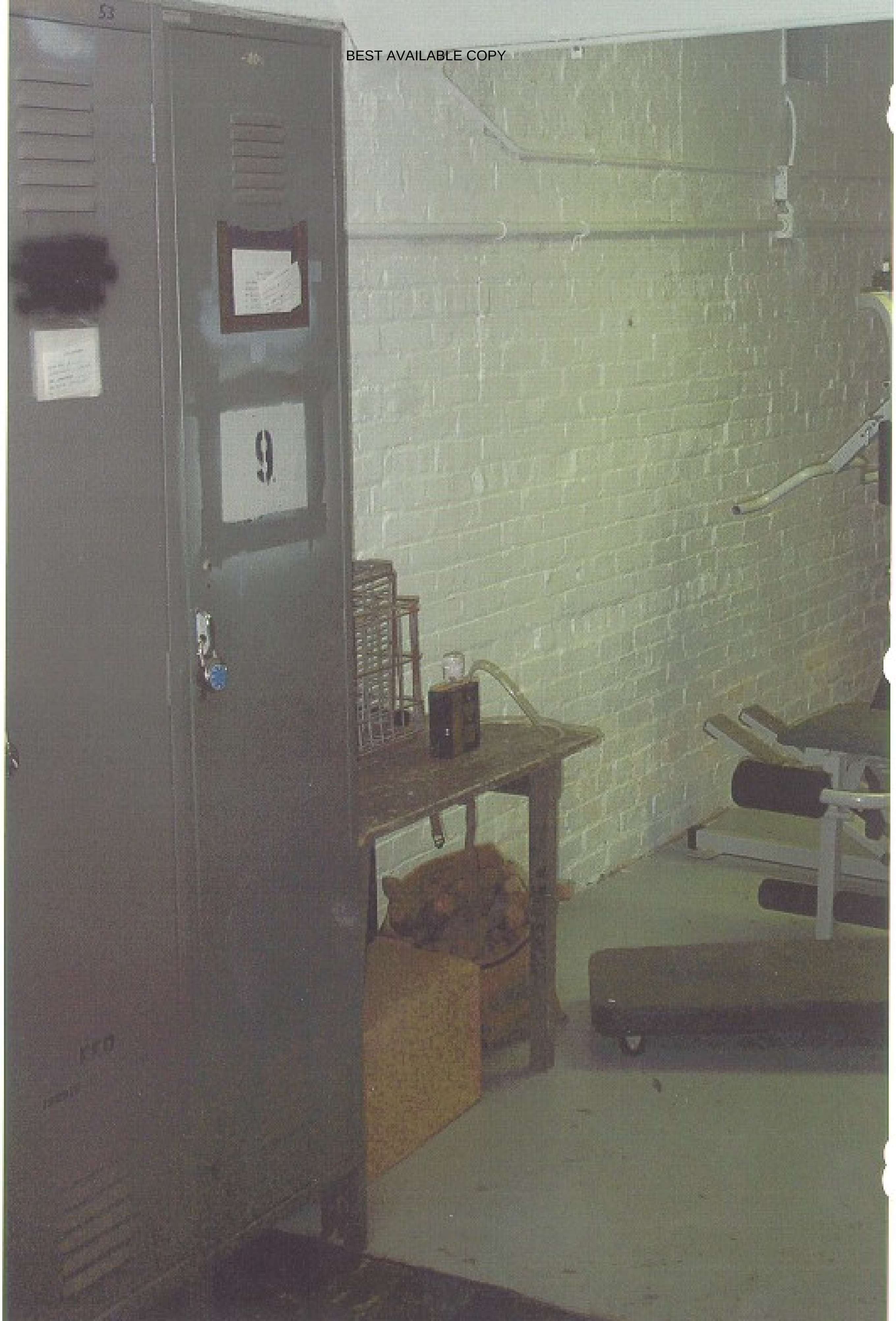
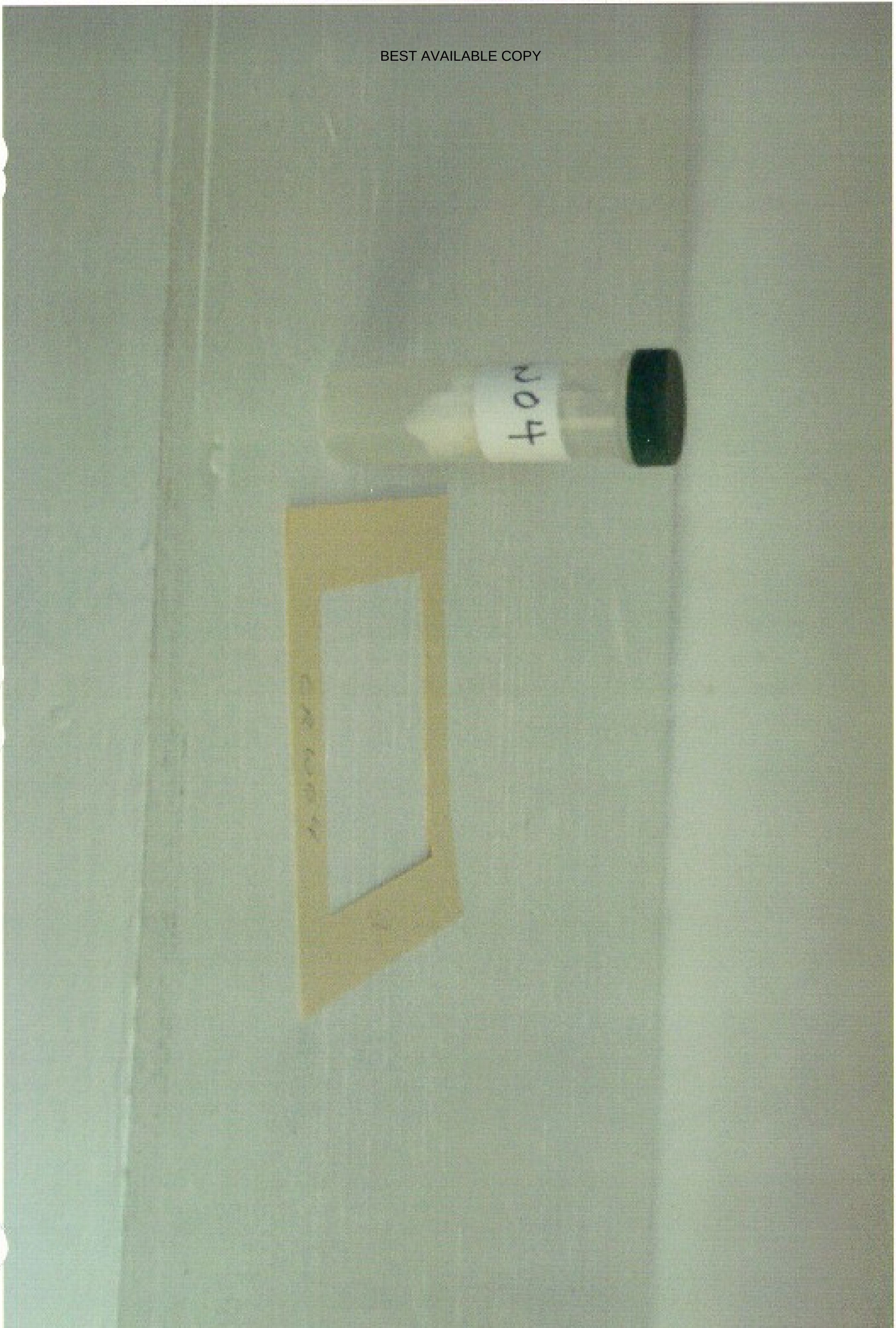
DCP_0995.JPG Unknown





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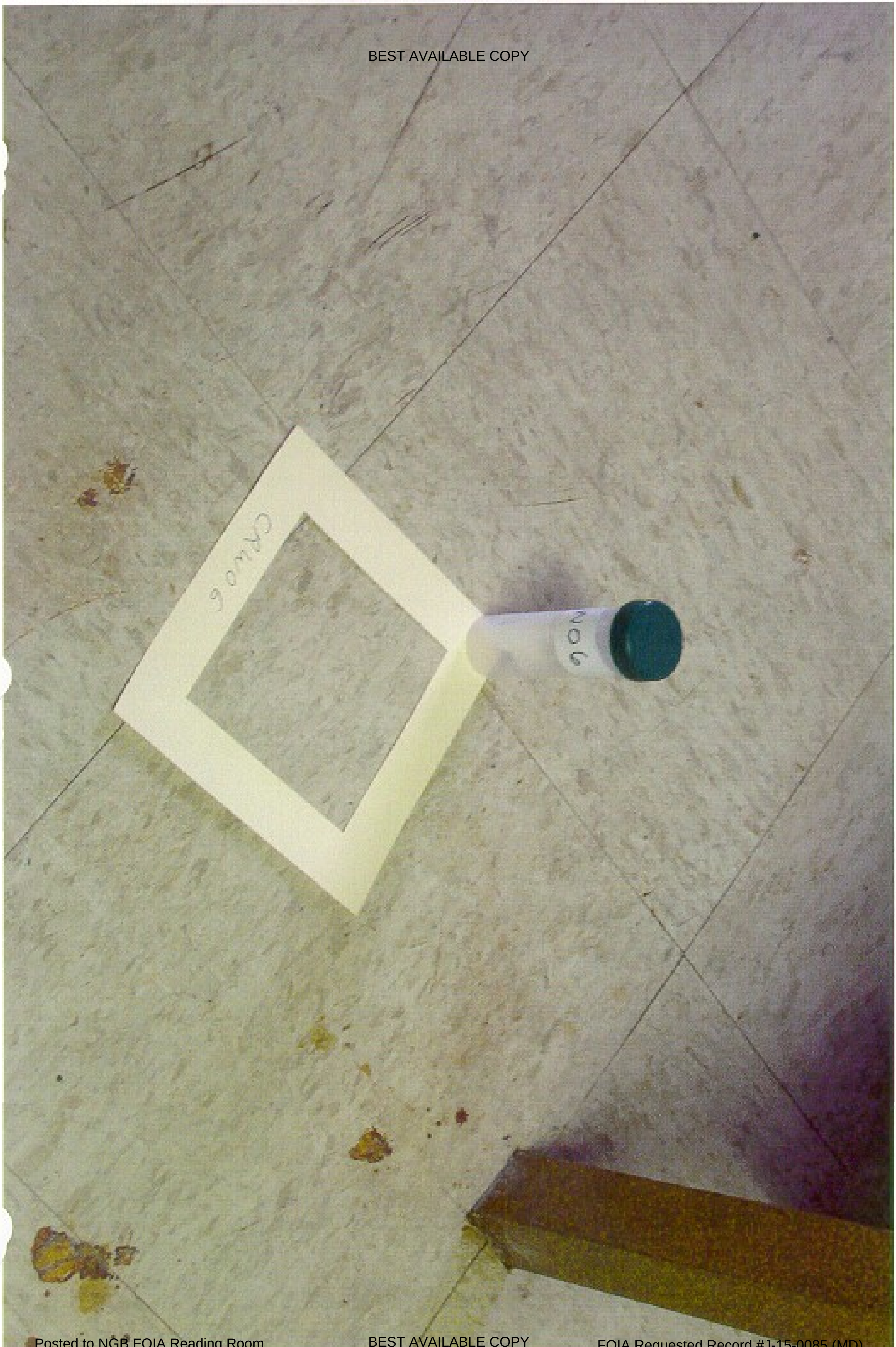

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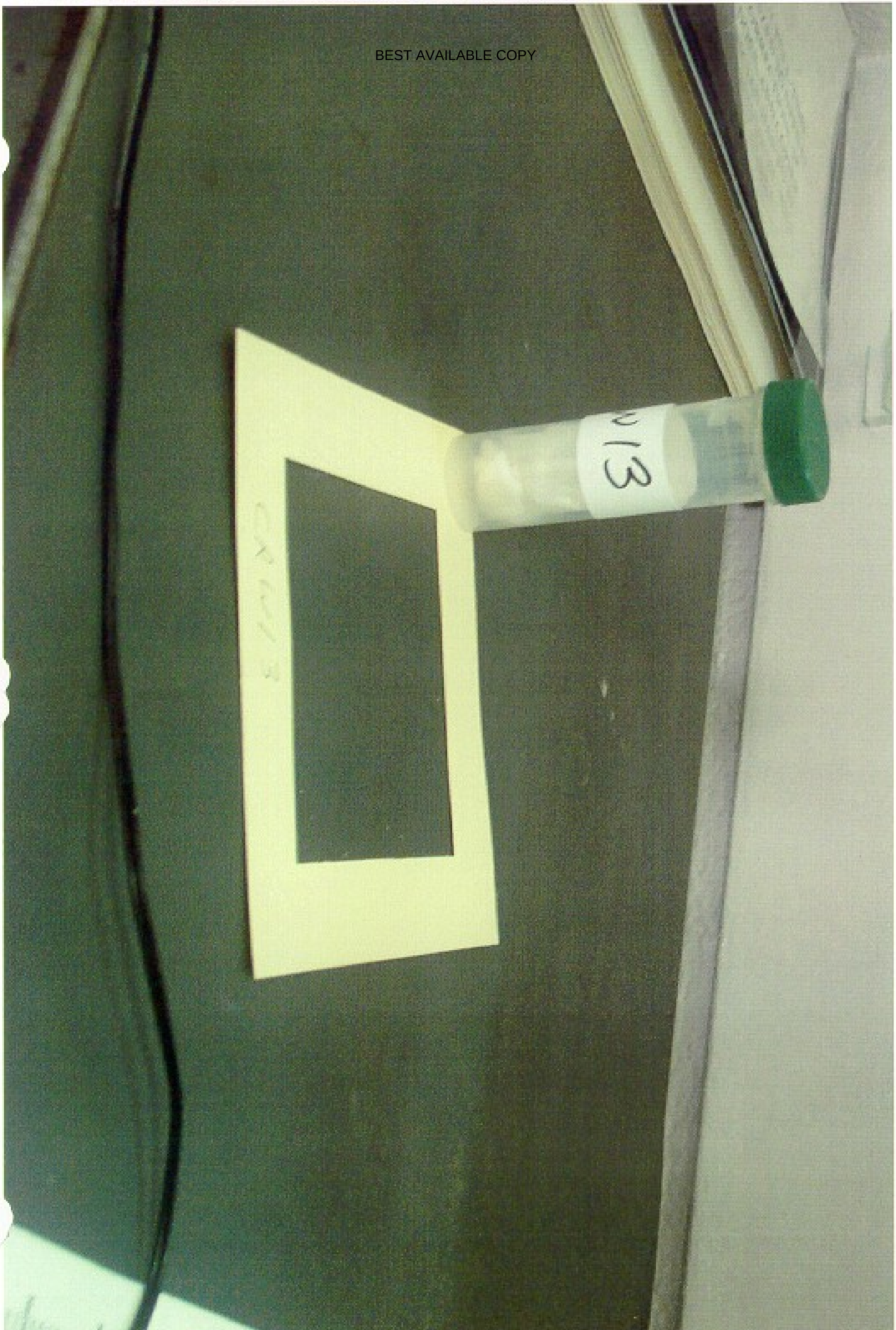

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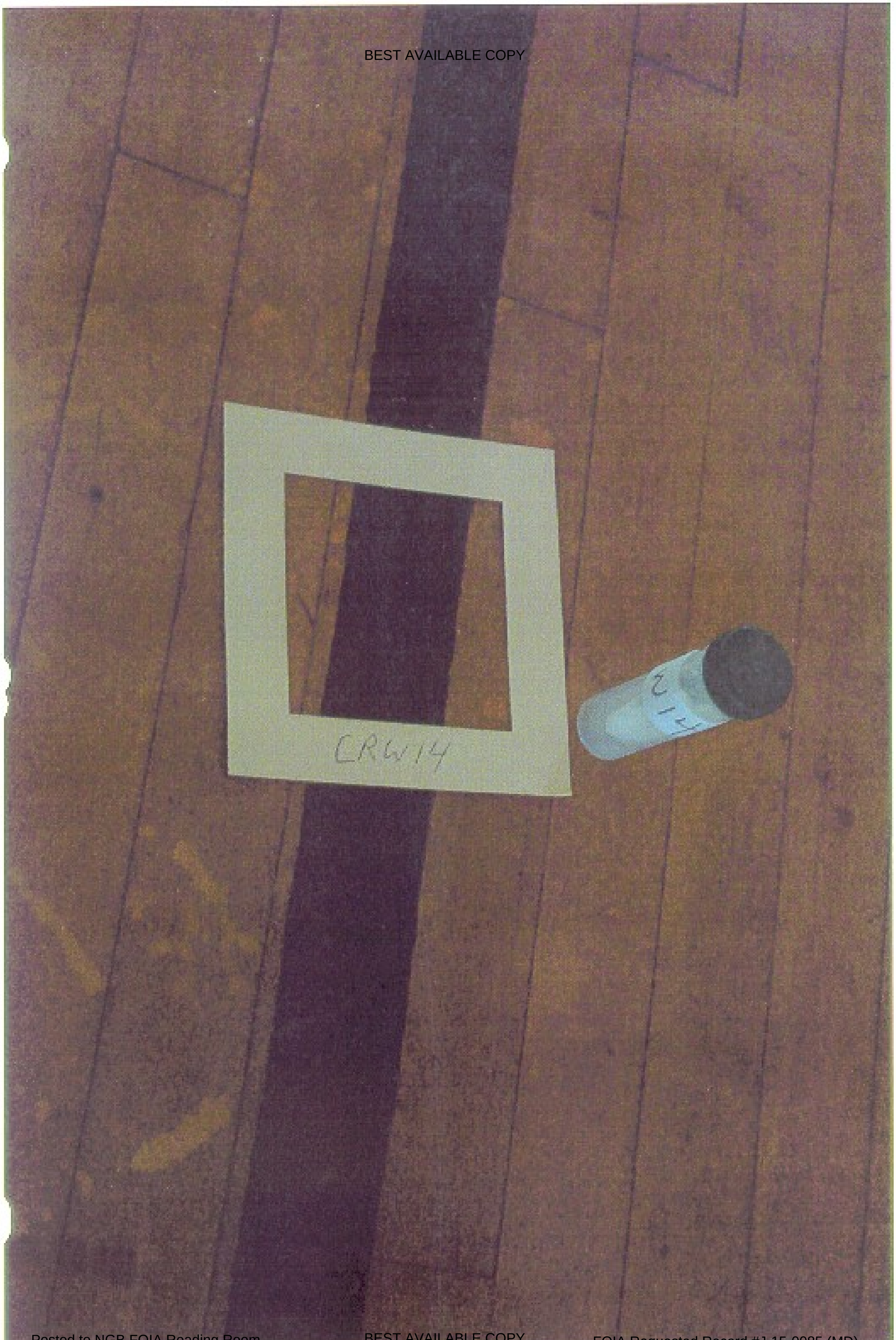

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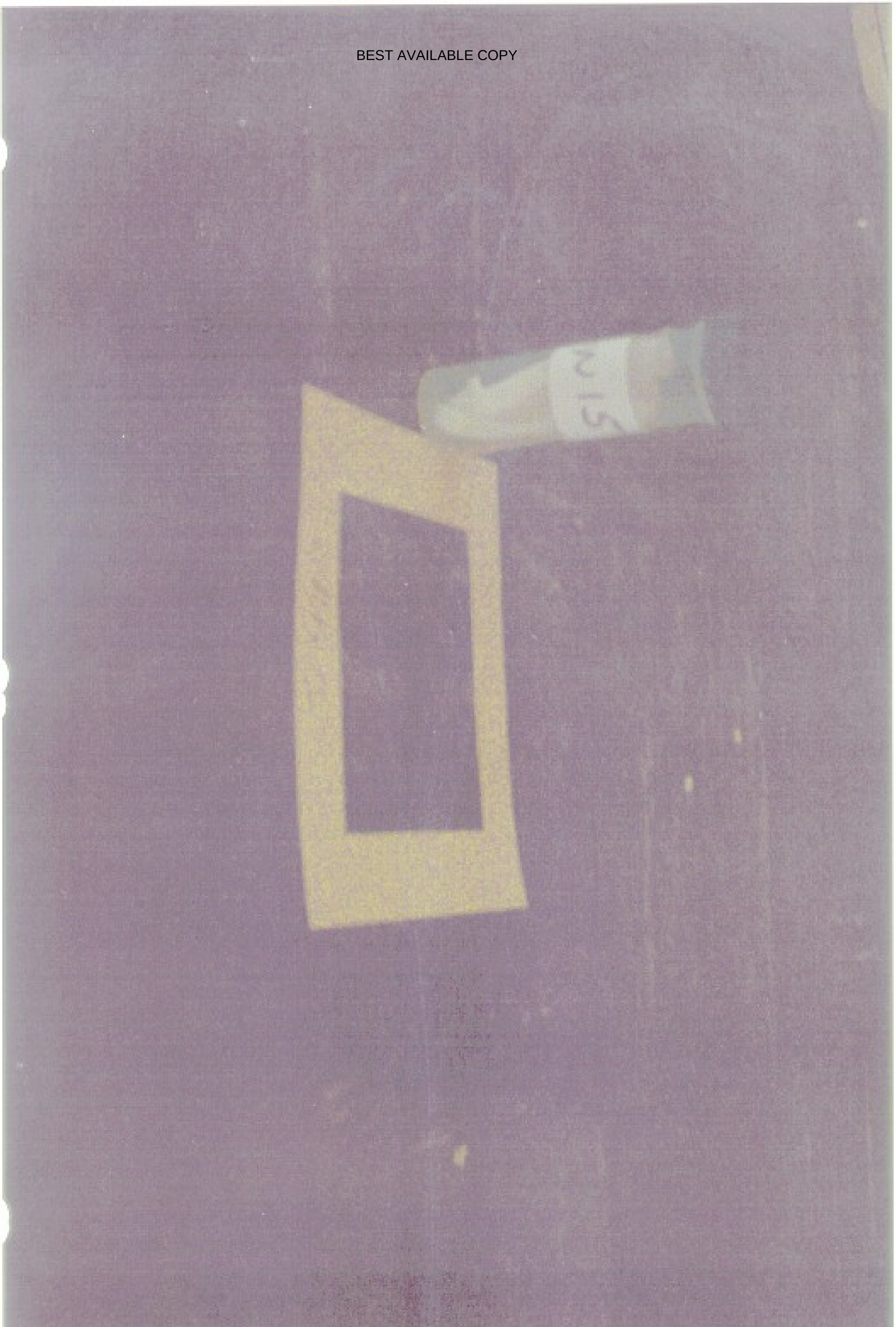

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Project No. 55-ML-01ED-03

APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

Wipe Sample #	Armory	City	Indoor Range Info: Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (µg/ft²)
CR W01	Crisfield	Crisfield		Yes		No	Locker room (former firing range), floor by cage (trap area)	31 µg/ft²
CR W02	Crisfield	Crisfield					Locker Room, floor, middle of room	13 µg/ft²
CR W03	Crisfield	Crisfield					Locker Room, floor, gym area	5.6 µg/ft²
CR W04	Crisfield	Crisfield					Supply Office, shelves, wall	4.1 µg/ft²
CR W05	Crisfield	Crisfield					Kitchen, table top, near far wall	9.2 µg/ft²
CR W06	Crisfield	Crisfield					Mechanical Room, floor near back wall	10 µg/ft²
CR W07	Crisfield	Crisfield					State's Office, desk top	4.6 µg/ft²
CR W08	Crisfield	Crisfield					Commander's Office, windowsill, middle of front wall.	17 µg/ft²
CR W09	Crisfield	Crisfield					Recruiter's Office, floor, near window wall	7.9 µg/ft²
CR W10	Crisfield	Crisfield					Ops/Readiness Office, desk top	3.8 µg/ft²
CR W11	Crisfield	Crisfield					Personnel Office, table top near window wall	3.3 µg/ft²
CR W12	Crisfield	Crisfield					Personnel Office, floor, near Ops wall	6.9 µg/ft²
CR W13	Crisfield	Crisfield					Copy/break room, desk top	17 µg/ft²
CR W14	Crisfield	Crisfield					Drill Hall, floor, center court	7.6 µg/ft²
CR W15	Crisfield	Crisfield					Drill Hall, floor of stage	4.3 µg/ft²

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AIHA

Client:	US Army - CHPPM	**Job Name:**	Salisbury/Crisfield	**Chain Of Custody:**	117739
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	09/17/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	17-Sep-03
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0367996	40903RR07	Flame	Air	260	N/A	11.54	ug/m³	<	12	ug/m³	
0367997	40903RR08	Flame	Air	254	N/A	11.81	ug/m³	<	12	ug/m³	
0367998	40903RR09 Bl	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	
0367999	40903RA10	Flame	Air	202	N/A	14.85	ug/m³	<	15	ug/m³	
0368000	40903RR11	Flame	Air	196	N/A	15.31	ug/m³	<	15	ug/m³	
0368001	40903RR12BL	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)

%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Analy[redacted] **Technical Manager:** [redacted]

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CERTIFICATE OF ANALYSIS

NVLAP
NY ELAP
AIHA

Client:	US Army - CHPPM	**Job Name:**	MD Arng/Crisfield	**Chain Of Custody:**	117744
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	9/18/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	18-Sep-03
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Final Result			Comments
0368082	CR Blank 1	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368083	CR W01	Furnace	Wipe	****	0.108	6.97	ug/ft²		31	ug/ft²	
0368084	CR W02	Furnace	Wipe	****	0.108	2.79	ug/ft²		13	ug/ft²	
0368085	CR W03	Furnace	Wipe	****	0.108	2.79	ug/ft²		5.6	ug/ft²	
0368086	CR W04	Furnace	Wipe	****	0.108	2.79	ug/ft²		4.1	ug/ft²	
0368087	CR W05	Furnace	Wipe	****	0.108	2.79	ug/ft²		9.2	ug/ft²	
0368088	CR Blank 2	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368089	CR W06	Furnace	Wipe	****	0.108	2.79	ug/ft²		10	ug/ft²	
0368090	CR W07	Furnace	Wipe	****	0.108	2.79	ug/ft²		4.6	ug/ft²	
0368091	CR W08	Furnace	Wipe	****	0.108	2.79	ug/ft²		17	ug/ft²	
0368092	CR W09	Furnace	Wipe	****	0.108	2.79	ug/ft²		7.9	ug/ft²	
0368093	CR W10	Furnace	Wipe	****	0.108	2.79	ug/ft²		3.8	ug/ft²	
0368094	CR Blank 3	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368095	CR W11	Furnace	Wipe	****	0.108	2.79	ug/ft²		3.3	ug/ft²	
0368096	CR W12	Furnace	Wipe	****	0.108	2.79	ug/ft²		6.9	ug/ft²	
0368097	CR W13	Furnace	Wipe	****	0.108	2.79	ug/ft²		17	ug/ft²	
0368098	CR W14	Furnace	Wipe	****	0.108	2.79	ug/ft²		7.6	ug/ft²	
0368099	CR W15	Furnace	Wipe	****	0.108	2.79	ug/ft²		4.3	ug/ft²	
0368100	CR Blank 4	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	

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CERTIFICATE OF ANALYSIS

NVLAP
NY ELAP
AIHA

Client:	US Army - CHPPM	**Job Name:**	MD Arng/Crisfield	**Chain Of Custody:**	117744
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	9/18/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	18-Sep-03
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Analyst: [redacted] Technical Manager: [redacted]

MDARNG Facilities IH Baseline Surveys MG (MD) Maurice D Tawes Armory, Crisfield, MD
Project No. 55-ML-01ED-03

APPENDIX E

REFERENCES

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APPENDIX E

REGULATIONS AND STANDARDS

1. Title 29, Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration, current ed. http://www.osha.gov/comp-links.html.

2. Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program, August 19, 1998. http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf.

3. AR 40-5, Medical Service, Preventive Medicine, 15 October 1990. http://www.usapa.army.mil/pdffiles/r40_5.pdf.

4. AR 385-10, The Army Safety Program, 29 February 2000. http://www.usapa.army.mil/pdffiles/r385_10.pdf.

5. DA PAM 40-503, Medical Services, Industrial Hygiene Program, 30 October 2000. http://www.usapa.army.mil/pdffiles/p40_503.pdf.

6. Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs), American Conference of Governmental Industrial Hygienists (ACGIH), current ed.

7. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 62-2002, Ventilation for Acceptable Indoor Air Quality.

8. RP-1-1993, Office Lighting, ANSI/ESNA.

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APPENDIX F

LEAD CLEANING GUIDANCE

Chapter 14: Cleaning

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.

2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.

3. Have sufficient cleaning equipment and supplies *before* beginning work.

4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.

5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.

6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.

7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.

8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.

9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.

10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.

11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.

12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.

13. Paint or otherwise seal treated surfaces and interior floors.

14. Conduct a clearance examination (see Chapter 15).

15. If clearance is not achieved, repeat the final cleaning.

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Step-by-Step Summary (continued)

16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.

17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.

18. Cleaning equipment list:

    - HEPA vacuums.
    - Detergent.
    - Waterproof gloves.
    - Rags.
    - Sponges.
    - Mops.
    - Buckets.
    - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
    - 6-mil plastic bags.
    - Debris containers.
    - Waste water containers.
    - Shovels.
    - Rakes.
    - Water-misting sprayers.
    - 6-mil polyethylene sheeting (or equivalent).

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Chapter 14: Cleaning

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris *and* dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?
- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

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Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards *and* were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

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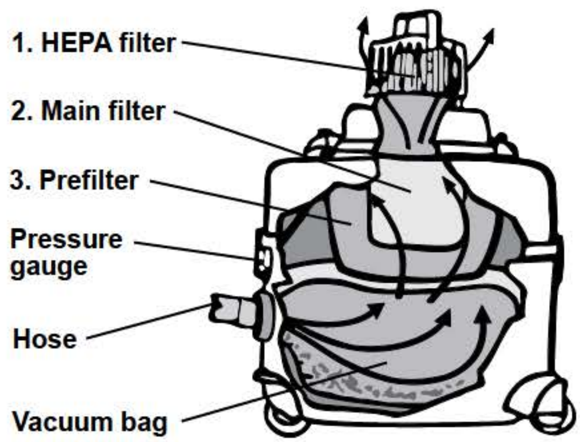
Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum
Most HEPA-vacuums have three filters: HEPA filter, main filter, and pre-filter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the pre-filter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

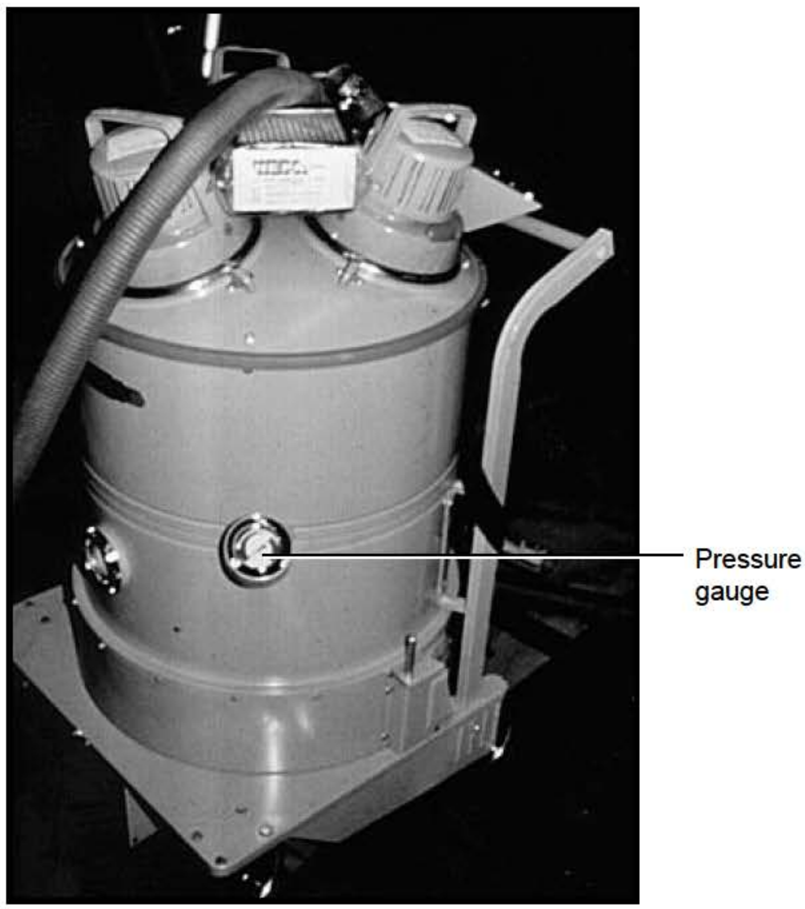
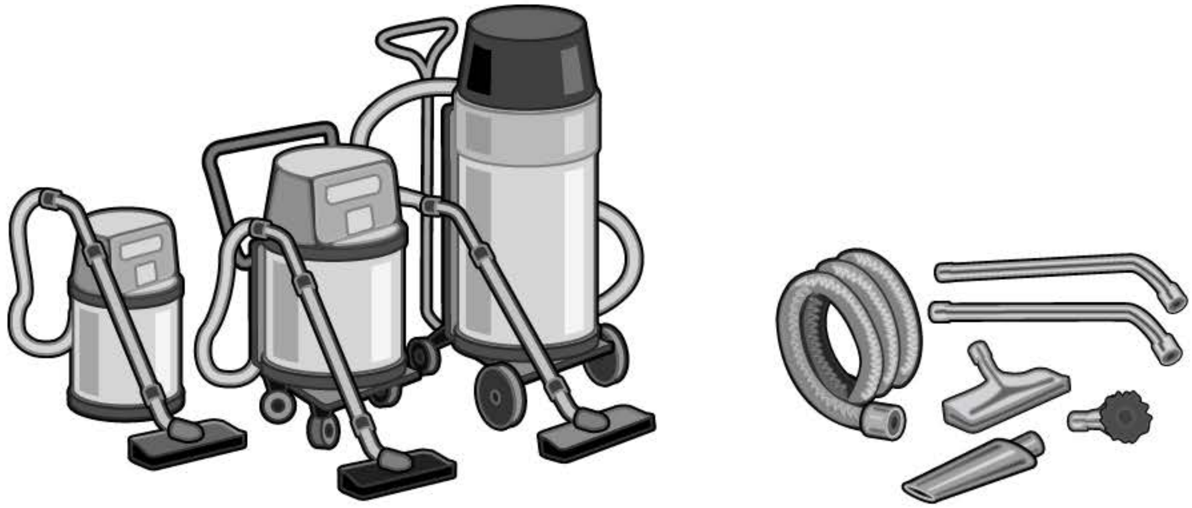


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

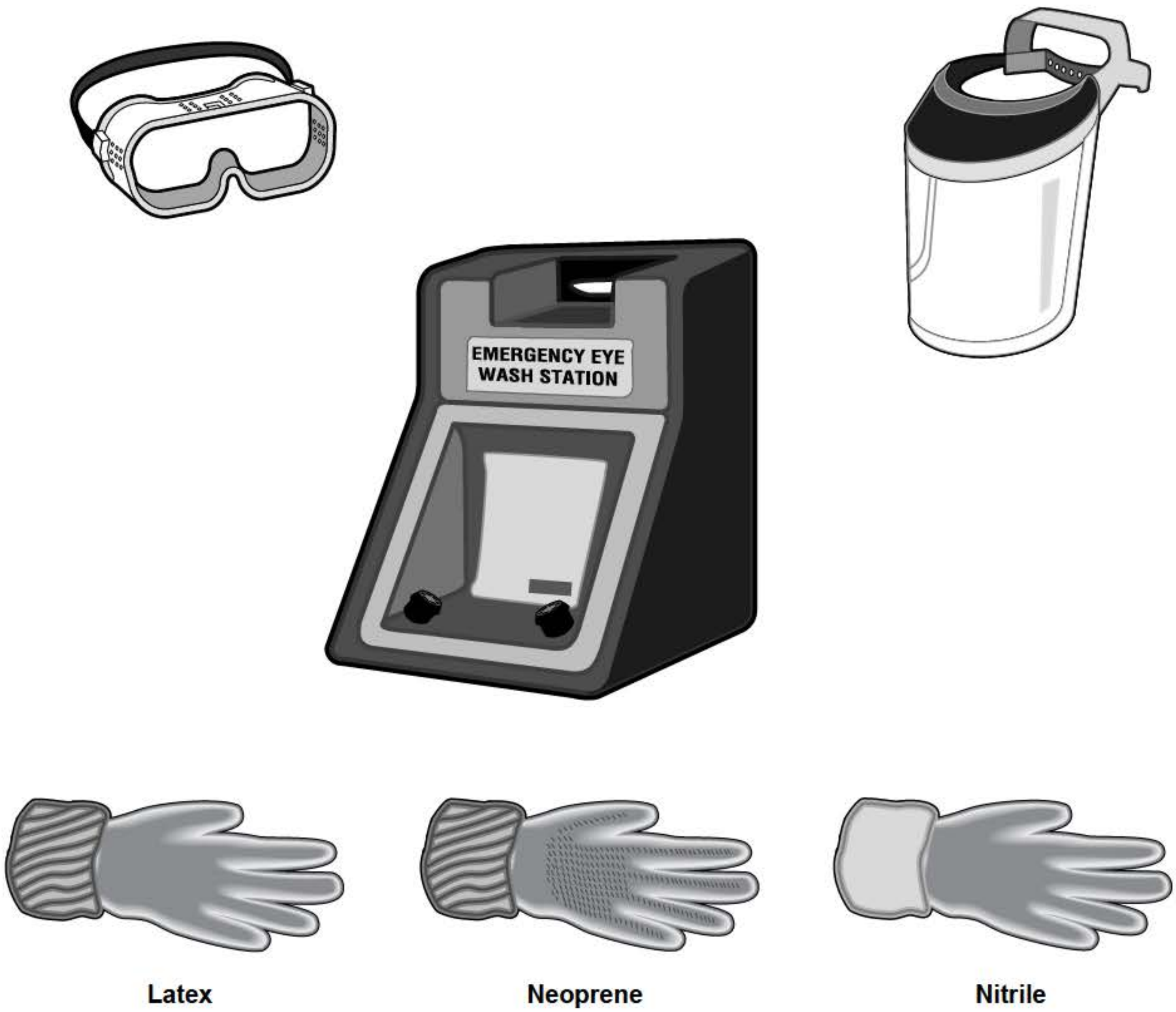
Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

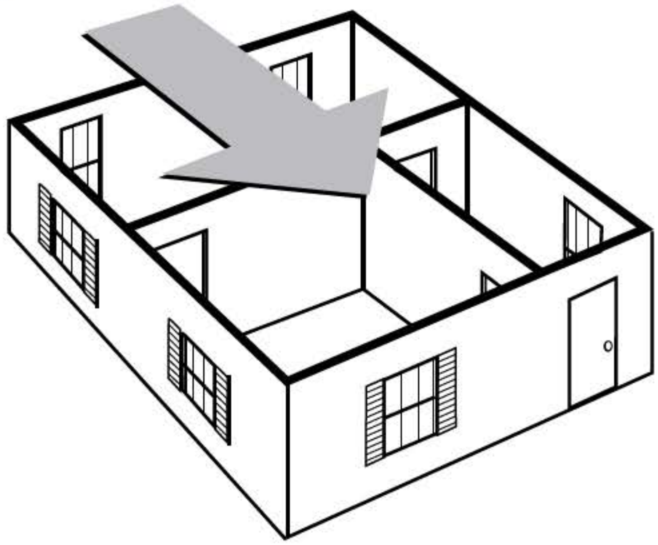
Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

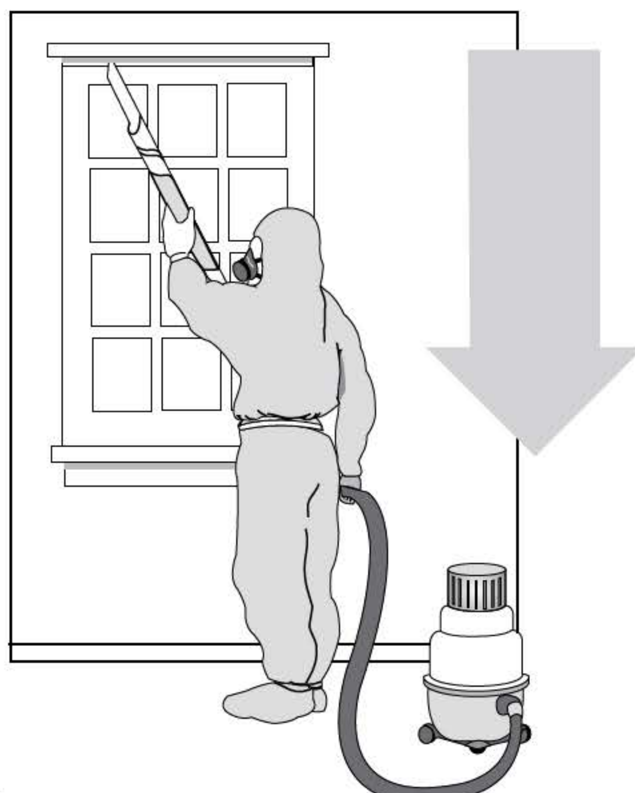
- First, the area is HEPA vacuumed.

Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on, and work down to the floor. Do every inch of the windows, especially the window troughs.



Courtesy: Alice Hamilton Occupational Health Center

- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.

Rubber Cone

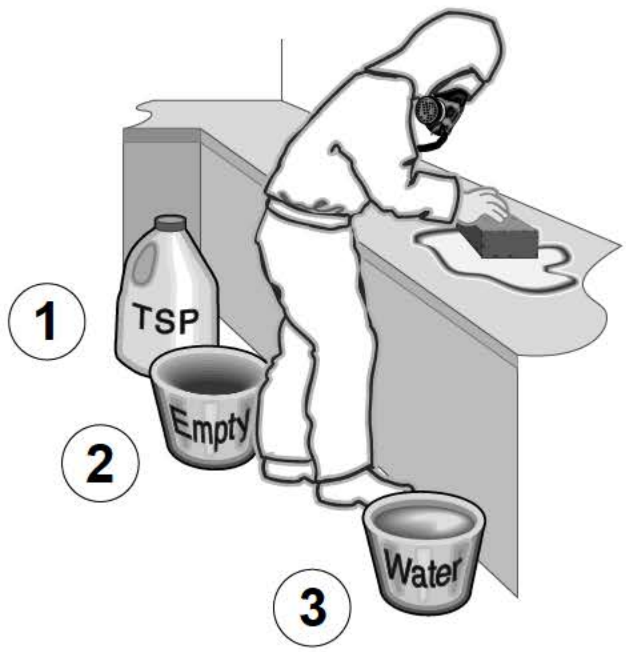
Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

Figure 14.4c (continued)

Wash all surfaces with suitable detergents
Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces

Wet Mop Floor

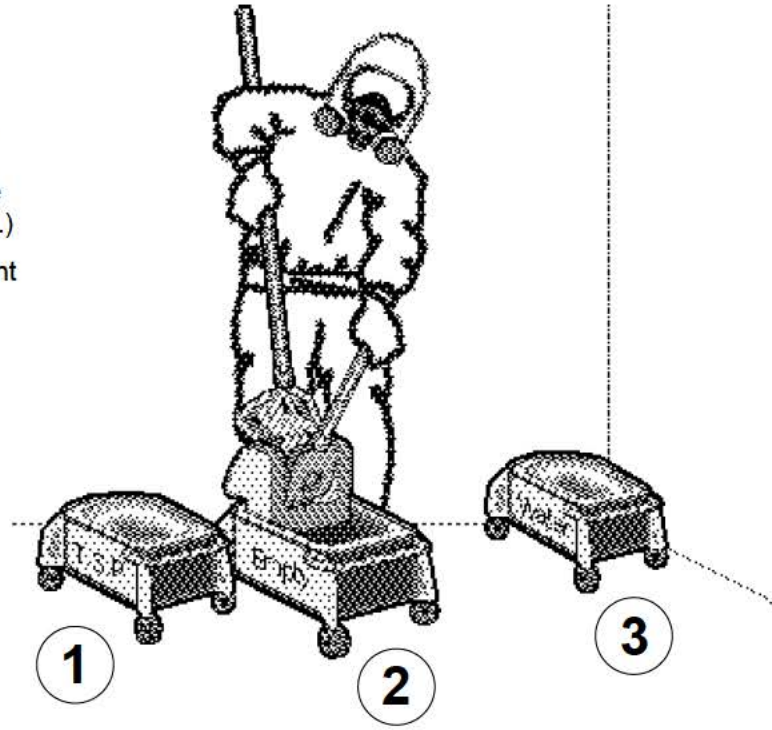
Don't Dry Sweep

Figure 14.4c (continued)

Use the 3-Bucket System.

To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.



Squeeze out the mophead in empty bucket #2. Return to bucket #1 for more detergent solution and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

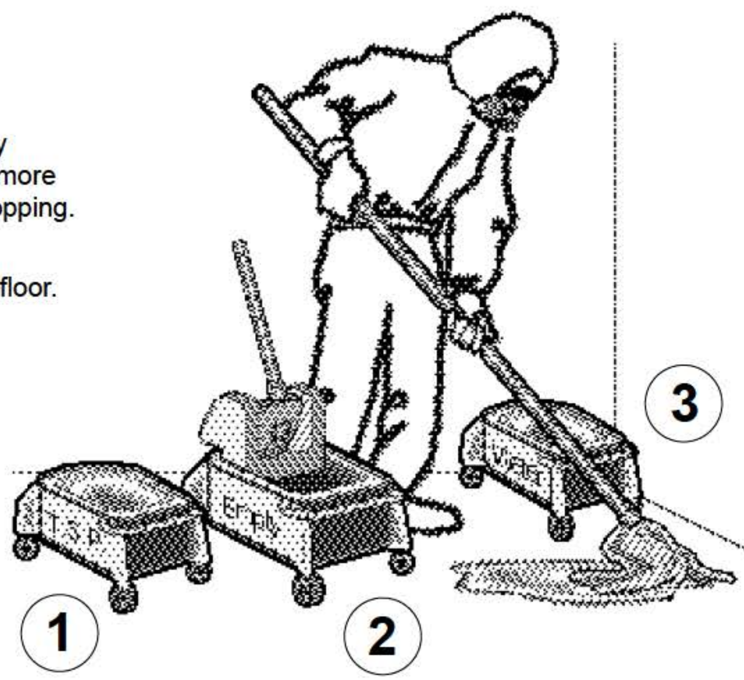
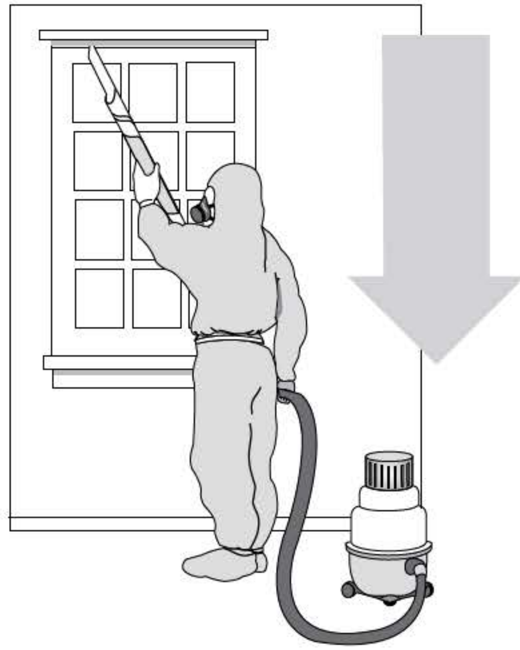


Figure 14.4d (continued)

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.

Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

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containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water *and cleaned.* All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).

Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This

option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dust-retaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table 14.1 Initial Cleaning Wipe-Test Failure Rates for Various Abatement Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)

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and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993).

These *Guidelines* do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Cycle Number	Mass Removal Efficiency Percentages			
	Cleaning Method			
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.8	67.0	29.4
5	59.3	88.9	72.1	32.5
6	61.6	91.2	74.4	34.9
7	63.8	93.1	76.4	36.5
8	67.5	95.4	77.5	38.1
9	67.5	97.7	78.7	40.1
10	67.2	100.0	80.2	41.7
11		102.3	80.2	41.7
12		104.6	84.1	44.8
13		104.6	84.5	46.8
14		103.8	84.5	48.4
15				49.6
16				50.8
17				52.4
18				53.6
19				54.4
20				55.2

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) *Effectiveness of Clean-up Techniques for Leaded Paint Dust*

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APPENDIX G

MOLD GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

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Readiness thru Health

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

Concern about indoor exposure to mold has been increasing as the public becomes more aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions.

This document provides the best and most current guidance for remediation of clean water damage (<48 hours) and mold contamination (>48 hours) into one resourceful Army guide. This guide has been designed to provide information to facilities management individuals who have little or no experience with mold remediation. It will assist them in making a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to develop or evaluate an in-house remediation plan or evaluate a remediation plan submitted by an outside contractor. If an outside contractor is employed, they must have experience cleaning up mold. Check their references, and have them follow the recommendations presented in this document, EPA guidelines, and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). A multi-disciplinary team approach to mold concerns is best. A health and safety professional, such as an industrial hygienist, should be consulted prior to any remediation activities to assist in the project.

Molds produce tiny spores to reproduce. Mold spores float through the indoor and outdoor air continually. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or uncorrected. There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.(1)

In all situations, the underlying cause of water accumulation must be rectified or mold growth will recur. Any initial water infiltration should be stopped and clean up began immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth. (Refer to Appendix A for detailed guidance on clean water damage response). If the source of water is elevated humidity, actions to maintain the relative humidity levels below 60% to inhibit mold growth should be taken (2). Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilating, and air-conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide adequate drainage and slope the ground away from the foundation.

REMEDIATION PLANNING

- Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Select cleanup methods for moldy items (Appendix B)
- Select Personal Protection Equipment (PPE)- protect remediators (Appendix B)
- Select containment equipment - protect building occupants (Appendix B)
- Select remediation personnel who have the experience and training needed to implement the remediation plan and use PPE and containment as appropriate

REMEDIATE MOISTURE AND MOLD PROBLEMS

- Fix moisture problem, implement repair plan and/or maintenance plan
- Dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Clean and dry moldy materials (Appendix B)
- Discard moldy porous items that can't be cleaned (Appendix B)

REMEDIATION PROCEDURES

Four levels of abatement are described below. The size of the area impacted by mold contamination primarily determines the type of remediation. The sizing levels below are based on professional judgment and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of mold and preventing dust contaminated with mold from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement. The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. (3)

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be discarded if possible. All materials to be reused should be dry and visibly free from mold. Routine inspections should be conducted to confirm the effectiveness of remediation work. (1 and 3)

The use of bleach or other biocides is questionable in most cases (8). The effectiveness of bleach in reducing living mold is dependent on concentration, residual chlorine levels, and contact time on the surface (8). All of these factors are difficult to control during remediation. Removal of all mold growth can generally be accomplished by physical removal of materials supporting active growth and thorough cleaning of non-porous materials (4). Therefore, application of a biocide serves no purpose that could not be accomplished with a detergent or cleaning agent (4).

The use of gaseous ozone or chlorine dioxide for remedial purposes is **not** recommended. Both compounds are highly toxic and contamination of occupied space may pose a health threat. Furthermore, the effectiveness of these treatments is unproven. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."(4)

FOUR REMEDIATION LEVELS

[Adapted from NYCDOH Guidelines on Assessment and Remediation of Fungi in Indoor Environments (3) and EPA (1)]

Level I: Small Isolated Areas – Total surface area affected less than 10 square feet - e.g., ceiling tiles, small areas on walls. Refer to Appendix B for detailed guidance.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas used by remediation workers for egress should be cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Level II: Medium – Total Surface Area affected between 10 and 100 square feet - e.g., several wallboard panels. (See Appendix B for detailed guidance).

The following procedures *at a minimum* are recommended:

Refer to Appendix C for proper PPE selection. Limited or Full protection may be required depending on the situation.

Refer to Appendix D for Containment procedures.

The work area and areas directly adjacent should be covered with a single layer of 6 mil fire-retardant polyethylene sheet(s) and taped before remediation, to contain dust/debris.

Seal ventilation ducts/grills in the work area and areas directly adjacent with 6 mil polyethylene sheeting. Use an exhaust fan with a High Efficiency Particulate Air (HEPA) filter to generate negative pressurization.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and surrounding areas should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level III be followed.

Level III: Large Area – Total Surface Area affected greater than 100 square feet or potential for increased occupant or remediator exposure during remediation is estimated to be significant. (See Appendix B for detailed guidance).

The following procedures are recommended:

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from occupied spaces using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft^2) follow Level I guidance for PPE and containment and for a areas (>10 ft^2) follow Medium (Level II) or when greater than 100 ft^2 follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended (7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and removed in double-bagged 6-mil plastic. When a decontamination room is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

All areas should be left dry and visibly free from contamination and debris.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air (4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If remediation sampling is necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HAZARD COMMUNICATION

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

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7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water Damage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£	
Water-Damaged Material†	**Actions**
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours§	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans.
Ceiling tiles	• Discard and replace.
Cellulose insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	• Discard and replace.

Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling should be pried away from wall for drying

£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.
These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

† If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

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Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

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APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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USACHPPM
Readiness thru Health

Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278
February 2002

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Table of Contents

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*[1] will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination[2].

Safety Tips While Investigating and Evaluating Mold and Moisture Problems[3]

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate[1].

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems[3].

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination[2].

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air[4]. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control[4]."

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program. For further mold assistance, contact USACHPPM, Industrial Hygiene Field Services Program, DSN 584-3118 or (410) 436-3118.

References

1. USACHPPM Technical Guide 277, *Army Facilities Management Information Document on Mold Remediation Issues*, February 2002.

2. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

3. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

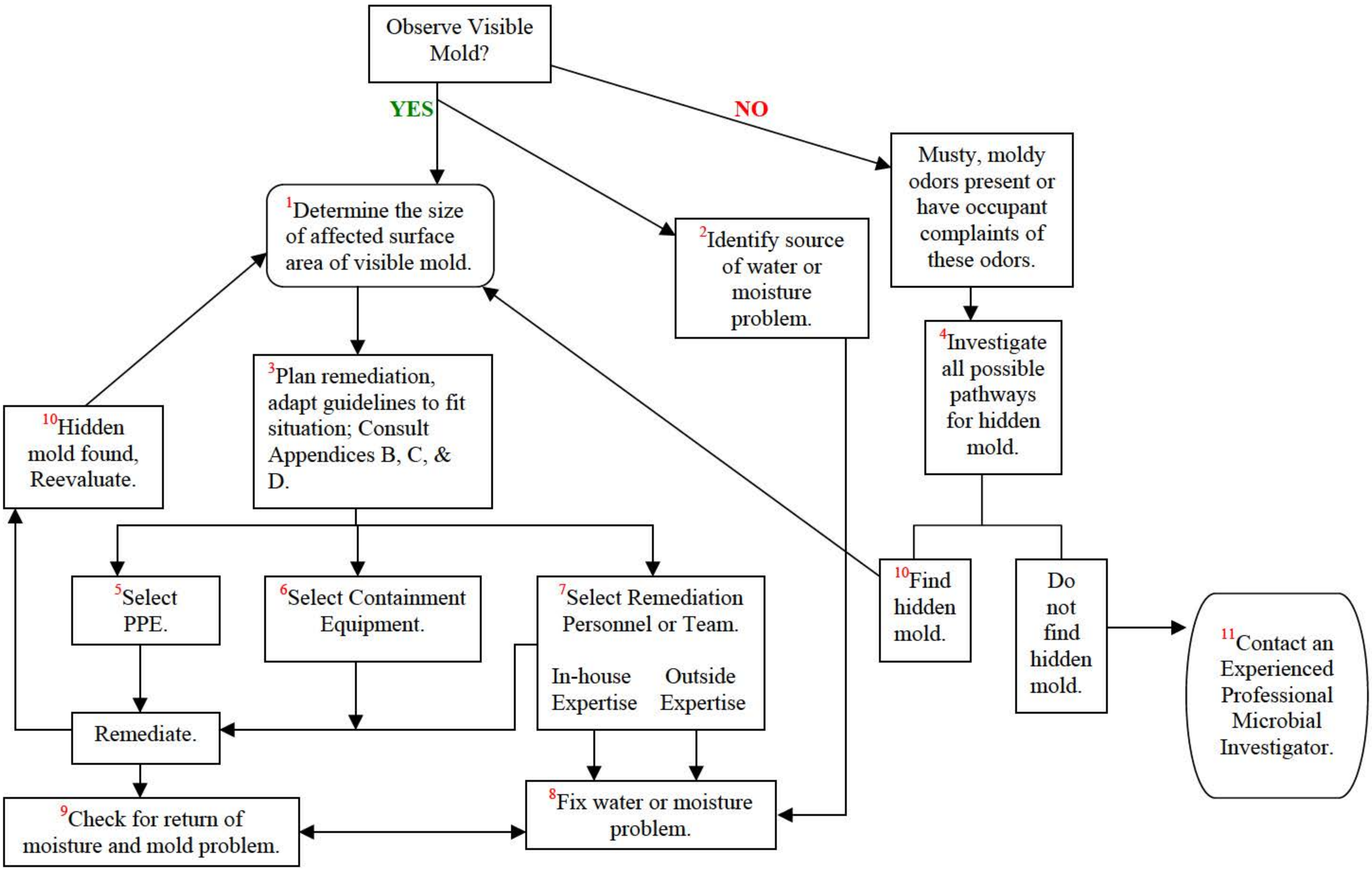
7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

MOLD INVESTIGATION DECISION LOGIC



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MOLD INVESTIGATION DECISION LOGIC NOTES:

1. Roughly approximate the total surface area of visible mold. Categorization of the remediation levels are sometimes borderline, so when trying to decide the category to apply, consider the extent of visible growth, such as a heavy blanket of growth on the surface, to barely visible. If heavy growth is apparent, consider moving up to the next level of protection.

2. Do not skip this step. Address the source of water or moisture problem or the mold will simply reappear.

3. Always protect the health and safety of the building occupants and remediators.

4. Mold may be hiding on the backside of drywall, vinyl wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads. Check walls behind furniture, pipe chases and utility tunnels, porous thermal or acoustic liners inside ductwork, or check the rafters (due to roof leaks or insufficient insulation)[3].

5. Utilize appendices B and C for remediation guidance. Use your best judgment during investigations, if not disturbing the mold you may need minimal to no PPE. Do not alarm building occupants unnecessarily, but protect yourself as necessary.

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities[3]. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
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Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
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Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
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Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
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*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

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- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

®TYVEK, DuPont de Nemours, E.I., & Co., Wilmington, DE.

APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

REPLY TO
ATTENTION OF

MCHB-TS-OFS May 2004

MEMORANDUM FOR Army National Guard Bureau (NGB) Region North Industrial Hygiene NGB-AVS-SI-IH [redacted], 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03 CAPT. Thomas Price Armory and Organization Maintenance Shop, Cumberland, MD

1. Enclosed is a copy of subject report and one CD-ROM.

2. Please direct any additional comments or concerns to Ms [redacted] at DSN 584-5475/3118, commercial (410) 436-5475/3118 or e-mail address at [redacted]@apg.amedd.army.mil.

ENCL

[redacted]
Industrial Hygienist
Industrial Hygiene Field Services Program

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U.S. Army Center for Health Promotion and Preventive Medicine

USACHPPM

MDARNG FACILITIES IH BASELINE SURVEY
CPT THOMAS PRICE ARMORY
CUMBERLAND, MD
55-ML-01ED-03

Approved for public release; distribution unlimited.

CHPPM FORM 432-E (MCHB-CS-IPD), OCT 03

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U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed $3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- *Integrity is the foundation*
- *Excellence is the standard*
- *Customer satisfaction is the focus*
- *Its people are the most valued resource*
- *Continuous quality improvement is its pathway*

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

CHPPM FORM 433-E (MCHB-CS-IPD), OCT 03 *(reverse)*

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS, CPT. THOMAS PRICE ARMORY CUMBERLAND, MD PROJECT NO. 55-ML-01ED-03

1. PURPOSE OF EVALUATION. To conduct surveys at Army National Guard (ARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions at ARNG facilities. The survey will serve to establish a baseline so that a worker's history of exposures is provided for each civilian or military employee.

2. CONCLUSIONS.

a. Indoor Air Quality.

(1) The building meets the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) standards for air quality for relative humidity and carbon dioxide levels.

(2) The temperature in one room exceeds the ASHRAE standard for an acceptable thermal environment.

b. Asbestos. There is a potential hazard from asbestos tiles throughout the armory that are damaged. Damaged asbestos tiles may become friable and asbestos fibers may be released.

c. Lead. Workers involved in renovation and abatement activities may be occupationally exposed to lead and asbestos. All air samples are below the laboratory analytical detection limits for lead in air. The air is not believed to be an exposure pathway for lead in this facility. There are surface dust-lead samples above the USACHPPM recommended decontamination levels. The elevated dust-lead in and adjacent to the converted indoor firing range when contacted may be hazardous to the general workforce and to children. These surface dust-lead samples also greatly exceeded the EPA lead exposure levels for children under six.

d. Safety. There is no door to exit the shop area. Garage doors are the only means of exit and they are electronically driven.

e. Illumination. All areas within the armory appear to be adequately lit. However, part of the back of the OMS does not have lighting installed.

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f. Ventilation. The exhaust system is not working in one of the maintenance bays. One part of the bay does not have an exhaust system.

3. RECOMMENDATIONS. The Department of Defense Risk Assessment Codes (RAC) for Health Hazards enables one to prioritize remedial action for hazards. Risk Assessments Codes range in magnitude from 1 to 5, with 1 being the highest priority.

a. Indoor Air Quality. The RAC for Thermal Environmental Conditions is 5. The temperature in Room 115 exceeds the ASHRAE standard for an acceptable thermal environment. Install more air conditioning units or fans to cool this room to between 73 and 79 degrees Fahrenheit in the summer. Maintain the temperature in the winter between 68 and 74.5 degrees Fahrenheit.

b. Asbestos. The RAC for Asbestos Exposure is classified as 5. Provide a written asbestos hazard management plan for all remaining asbestos in this facility. Remove and replace the damaged asbestos tiles.

c. Lead. The RAC for this armory for Lead Exposure is classified as 4. To minimize lead exposure, clean all areas in and adjacent to the converted indoor firing range where sampling results show elevated levels of lead. Comprehensive guidelines for cleaning are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities. There is a potential for taking lead contamination out of the workplace into their vehicles and homes. Wear disposable gloves and disposable coveralls as extra protection when working in areas identified as having elevated levels of lead. Address all potential lead hazards before extending this facility to use for children. If children will be using this facility, clean surfaces to the EPA dust-lead standards for young children of $40 \mu g/ft^2$ on floors and $100 \mu g/ft^2$ for dust-lead on window sills. Test drinking water from water fountains and faucets for lead.

d. Safety. The RAC for Safety Hazards is classified as 5. There is no door to exit the shop area. Garage doors are the only means of exit and they are electrically driven. Ensure that the armory complies with all provisions of section 39.2.42 of The National Fire Protection Association (NFPA) 101 Life Safety Code 2003. This section addresses the number and distance requirements for exits. Install lighting in the area of the OMS that does not have adequate lighting installed. The exhaust system is not working in one of the maintenance bays. One part of the bay does not have an exhaust system. Install one vehicle tailpipe exhaust outlet per work bay per guidance provided in the Army National Guard Bureau Design Guide for Logistics Facilities (DG 415-2) (1990). This issue is currently being addressed by USACHPPM.

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e. Illumination. Install lighting in the area of the OMS that does not have adequate lighting installed.

f. Ventilation. The exhaust system is not working in one of the maintenance bays. One part of the bay does not have an exhaust system. Install one vehicle tailpipe exhaust outlet per work bay per guidance provided in the Army National Guard Bureau Design Guide for Logistics Facilities (DG 415-2) (1990).

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MDARNG Facilities IH Baseline Surveys CPT Thomas Price Armory, Cumberland, MD
Project No. 55-ML-01ED-03

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5158 BLACKHAWK ROAD
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REPLY TO
ATTENTION OF

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03

LOCATION: CAPT. Thomas Price Armory and Organization Maintenance Shop, Cumberland, MD

1. AUTHORITY. E-Mail dated 28 February 2003 from Ms[redacted], Industrial Hygienist, MD Army National Guard, to the USACHPPM Industrial Hygiene Field Services Program.

2. PURPOSE OF EVALUATION. To conduct surveys at Army National Guard (ARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions at ARNG facilities. The survey will serve to establish a baseline so that a worker's history of exposures is provided for each civilian or military employee.

3. BACKGROUND INFORMATION.

a. Armory Mission. 121st Engineering Battalion Mechanized.

a. Date of Construction. 1959.

c. Survey Date. 20 August 2003.

d. POC. SGM[redacted] (301) 678-6912 and SGT [redacted] (410) 702-9772; (410) 446-2972.

4. SUMMARY OF ACTIONS.

a. Sampling. Surface dust-lead wipe and air sampling was conducted to determine the existence of lead-based paint and/or lead-based paint hazards (paint-lead hazards). Sample locations are in Appendix D. Temperature, carbon dioxide, and relative humidity measurements were collected to determine indoor air quality.

b. Physical Condition of Facilities.

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(1) Paint. Sergeant [redacted], Environmental Compliance Assessment Coordinator for the MD NGB, stated that all asbestos and lead-based paint has been abated.

(2) Asbestos. Staff Sergeant [redacted] stated that all asbestos has been abated. However, we did see tiles suspected of containing asbestos throughout the armory that were damaged and cracked. Some of the tiles were loose and felt “squishy” when they were stepped on. We observed that asbestos has been removed from the pipes.

(3) Mold. No mold was observed.

(4) Safety Hazards. No safety hazards were observed.

c. Other Building Issues.

(1) The exhaust system is not working in one of the maintenance bays. One part of the bay does not have an exhaust system.

(2) There is no door to exit the shop area. Garage doors are the only means of exit and they are electrically driven.

d. Safety and Industrial Hygiene Programs.

(1) There are no written program records at the armory.

(2) Personal protective equipment is worn at all times in the OMS.

e. Heating, Ventilation, and Air-conditioning System. The armory and the Organization Maintenance Shop (OMS) is heated with natural gas. Ventilation and air are provided by window-mounted air conditioning units and the manual operation of windows.

f. Noise Dosimetry. No operation that could produce hazardous noise levels was identified.

g. Lighting. All areas within the armory appeared to be adequately lit and occupants reported no areas of deficient lighting. Part of the back of the OMS does not have lighting installed

h. Converted indoor firing range (IFR). Staff Sergeant [redacted], Environmental Compliance Assessment Coordinator for the MD NGB, stated that all lead in the converted indoor firing range had been abated during its conversion. The IFR was converted to a locker room.

i. Photographs (Appendix C).

j. Site Maps (Appendix B).

k. Facility use by children. The POC stated that children use this facility occasionally.

5. ASSESSMENT CRITERIA. (Appendix A).

6. SAMPLING RESULTS.

a. Indoor Air Quality. The relative humidity and carbon dioxide levels were all within normal ranges. One indoor room exceeded the ASHRAE indoor air quality standard for temperature. Outside the temperature was 77.7 degrees F, the relative humidity was 63.1 %, and the carbon dioxide level was 285 ppm. In Room 106, the temperature was 79.0 degrees F, the relative humidity was 59.3%, and the carbon dioxide level was 305 ppm. In Room 115 the temperature was 81.0 degrees F, the relative humidity was 56.4 %, and the carbon dioxide level was 338 ppm. In the OMS office the temperature was 79.4 degrees F, the relative humidity was 37.1 %, and the carbon dioxide level was 625 ppm.

b. Lead in air and surface dust-lead wipe sample results are shown in Appendix D. All air sample results were below the laboratory analytical detection limits of 0.004 mg/m^3 and 0.005 mg/m^3 lead in air. Three of 14 dust-lead surface wipes exceeded the USACHPPM recommended decontamination level of 200 $\mu g/ft^2$ for floors and other frequently-contacted surfaces. These samples also exceeded the EPA lead exposure levels for children under six.

7. DISCUSSION AND CONCLUSIONS.

a. Indoor Air Quality. The relative humidity and carbon dioxide levels were within ASHRAE standards for air quality. The temperature in one room exceeded ASHRAE standards.

b. Asbestos. There were asbestos tiles throughout the armory that were damaged and cracked. Some of the tiles were loose and felt “squishy” when they were stepped on. Damaged asbestos tiles may become friable and asbestos fibers may be released. There is a potential hazard from these damaged asbestos tiles. Army policy requires the armory to establish and execute an asbestos hazard management plan for all asbestos in the facility, and to take immediate corrective action where a possible asbestos-related health hazard has been identified. We did observe that asbestos has been removed from the pipes.

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c. Lead.

(1) Air samples. All air samples are below the laboratory analytical detection limit for lead in air of 0.004 to 0.005 mg/m^3.

(2) Dust-lead. One of the surface wipe samples exceeding USACHPPM decontamination guidance was collected in the area where the baffle used to be in the old IFR (1552). One was collected from the floor midpoint of the IFR lanes (1553). The other one was collected on the floor in the supply office Room 122 (1555).

(3) Child exposure to dust lead. These surface dust-lead wipe samples also greatly exceeded the EPA lead exposure levels for children. EPA regulations define dust-lead standards for young children in child-occupied facilities. The EPA standard for dust-lead on floors is 40µg/ft^2, and 100µg/ft^2 for dust-lead on window sills. These levels were developed for children under 6 spending at least 60 hours per year in pre-1978 facilities. Although this armory does not meet the EPA definition of child-occupied facility's minimum time requirement for child use, USACHPPM believes that there is a potential hazard for children using this facility. AR 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them. Although this facility may comply with EPA and Army regulations, exposures for children under six may exceed those that the regulations are intended to prevent.

(4) Occupational Exposure. Elevated levels of dust-lead exist on surfaces that may be contacted by the general workforce. Workers involved in renovation and abatement activities may be occupationally exposed to lead.

d. Safety. There is no door to exit the shop area. Garage doors are the only means of exit and they are electrically driven.

e. Illumination. Part of the back of the OMS does not have lighting installed. There is no door to exit the shop area. Garage doors are the only means of exit and they are electrically driven.

f. Ventilation. The exhaust system is not working in one of the maintenance bays. One part of the bay does not have an exhaust system.

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MDARNG Facilities IH Baseline Surveys, CAPT. Thomas Price Armory and Organization Maintenance Shop, Cumberland, MD Project No. 55-ML-01ED-03

9. RECOMMENDATIONS. Enclosure.

10. ADDITIONAL ASSISTANCE. For additional assistance, or questions concerning this report, please contact the undersigned at DSN 584-3118, commercial 410-436-3118, or by e-mail [redacted]@apg.amedd.army.mil.

[redacted]
INDUSTRIAL HYGIENIST
USACHPPM LEAD AND ASBESTOS TEAM LEADER
Industrial Hygiene Field Services Program
EPA AHERA Asbestos Inspector and Management Planner/
Certification Number MD-070340
EPA Lead Inspector and Lead Risk Assessor/
Certification Number 04-7913

MDARNG Facilities IH Baseline Surveys, CAPT. Thomas Price Armory and Organization Maintenance Shop, Cumberland, MD Project No. 55-ML-01ED-03

ENCLOSURE

CUMBERLAND ARMORY RECOMMENDATIONS

The Department of Defense Instruction Number (DODI) 6055.1 provides Risk Assessment Codes (RAC) for Health Hazards, a procedure which allows us to assess the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and combines the hazard severity and accident probability into a single numeral. RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority. The RAC for this armory for Lead Exposure is classified as 4. The RAC for Asbestos Exposure is 3. The RAC for Thermal Conditions is 5. DODI 6055.1 also provides RACs for Safety and Ergonomic Hazards. The RAC for Safety Hazards is classified as 5.

1. RAC # 1. Lead Exposure.

a. Clean all areas in and adjacent to the old IFR where sampling results showed elevated levels of lead. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup.

b. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities. These workers are required to be in compliance with the OSHA lead in construction standard 29 CFR 1926.62.

c. There is a potential for personnel taking lead contamination out of the workplace into their vehicles and homes. Wear disposable gloves and disposable coveralls as extra protection when working in areas identified as having elevated levels of lead.

d. Test drinking water from water fountains and faucets for lead. It could not be determined if this has been done.

e. Address all potential lead hazards before extending this facility to use for children. If children will be using this facility, clean surfaces to the EPA dust-lead standards for young children of 40 $\mu g/ft^2$ on floors and 100$\mu g/ft^2$ for dust-lead on window sills.

2. RAC # 2. Asbestos Exposure. Provide a written asbestos hazard management plan for all remaining asbestos in the facility. Army regulation 200-1 (Environmental Protection and Enhancement) requires the armory to establish and execute an asbestos hazard management plan for all asbestos in the facility, and to take immediate

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corrective action where a possible asbestos-related health hazard has been identified. Damaged asbestos tiles may become friable and asbestos fibers may be released. Remove and replace the damaged asbestos tiles.

3. RAC # 3. Thermal Conditions. The armory relative humidity and carbon dioxide levels meet ASHRAE standards for air quality. The temperature in Room 115 exceeds the ASHRAE standard for an acceptable thermal environment. Install more air conditioning units or fans to cool Room 115 to between 73-79 degrees Fahrenheit in the summer. The temperature in the winter should be between 68-74.5 degrees Fahrenheit.

4. RAC # 4. Safety Hazards.

a. There is no door to exit the shop area. Garage doors are the only means of exit and they are electrically driven. Ensure that the armory complies with all provisions of section 39.2.42 of The National Fire Protection Association (NFPA) 101 Life Safety Code 2003. This section addresses the number and distance requirements for exits.

b. Install lighting in the area of the OMS that does not have adequate lighting installed.

5. Additional Recommendations. The exhaust system is not working in one of the maintenance bays. One part of the bay does not have an exhaust system. Install one vehicle tailpipe exhaust outlet per work bay per guidance provided in the Army National Guard Bureau Design Guide for Logistics Facilities (DG 415-2) (1990). (This issue is currently being addressed by USACHPPM. Additional information will be provided when it becomes available).

APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

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Subject: Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 $\mu g/ft^2$. This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. EPA standards (40 CFR 745.227(e)(8)(viii))are not directly applicable because they are developed for floors (40 $\mu g/ft^2$), windowsills (250 $\mu g/ft^2$) and window troughs (400 $\mu g/ft^2$) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. OSHA has no specific requirement for work area surfaces. The lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. OSHA used to cite a level of 200 $\mu g/ft^2$ in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 $\mu g/ft^2$ is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels above these recommendations do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All states will receive this guidance when it is completed.

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m^3 averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

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APPENDIX B

SITE MAPS

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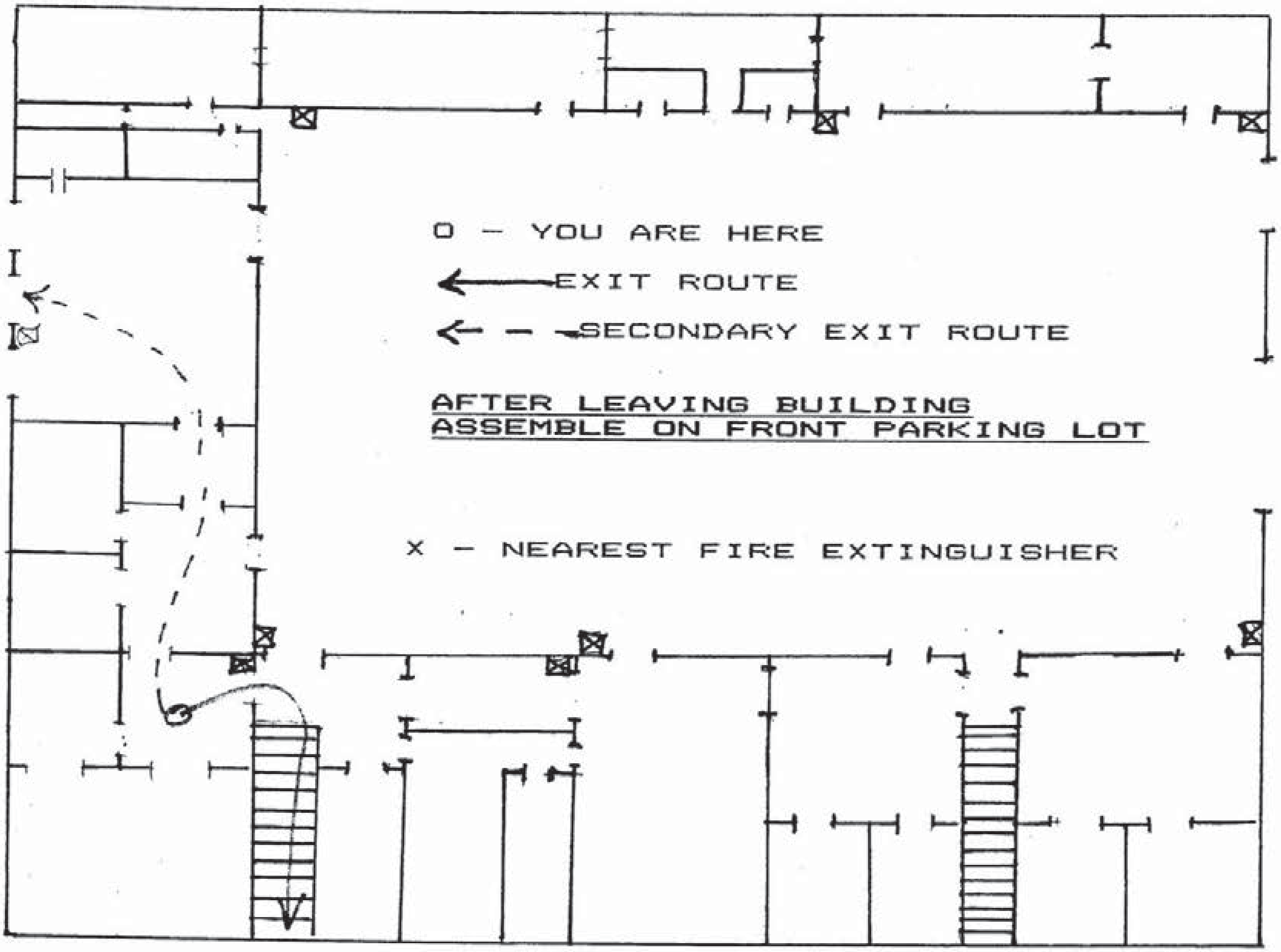

FIRE PLAN LEARNING CENTER OFFICE

CUMBERLAND NG ARMORY

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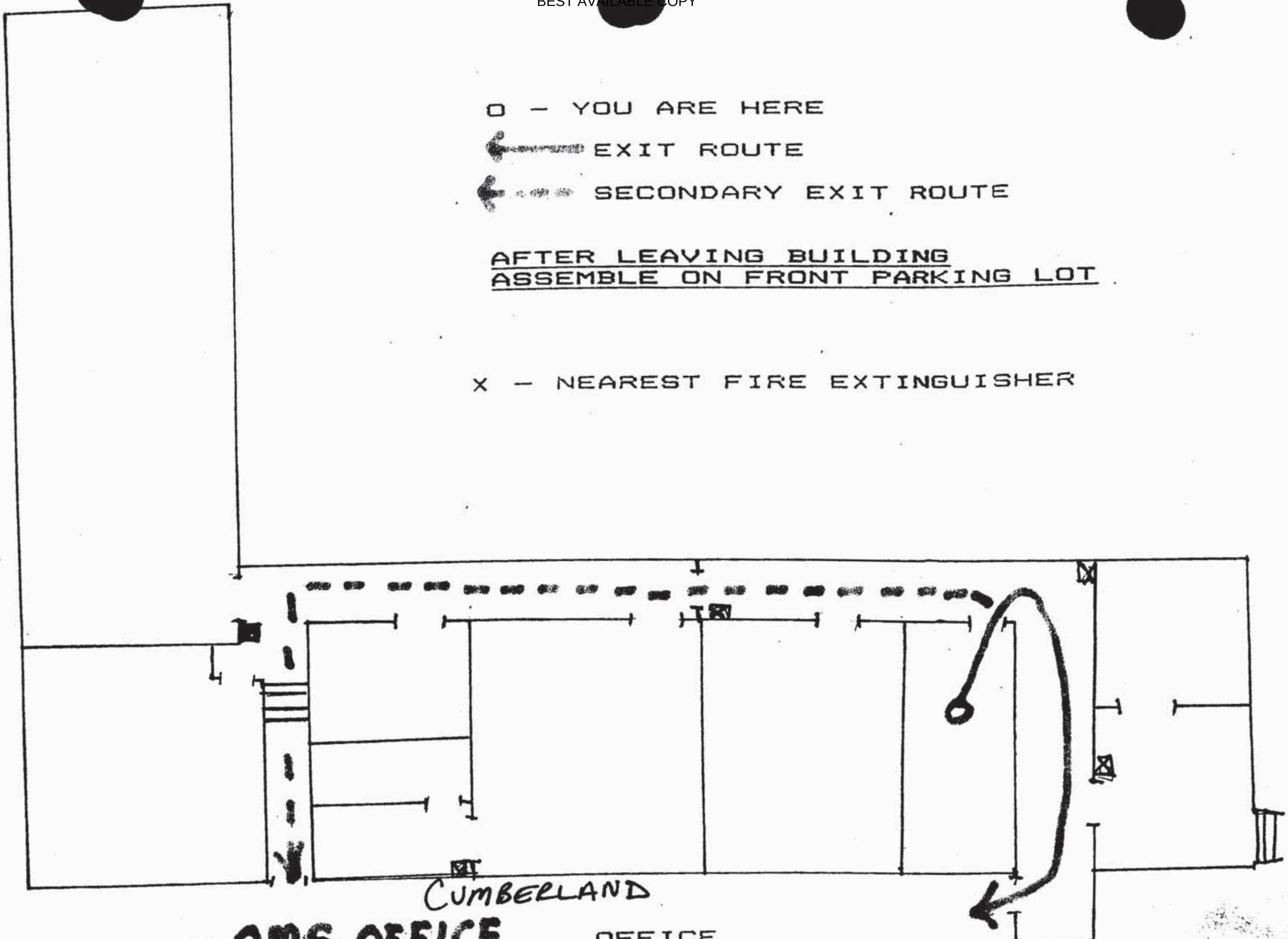

FIRE PLAN OMS OFFICE OFFICE

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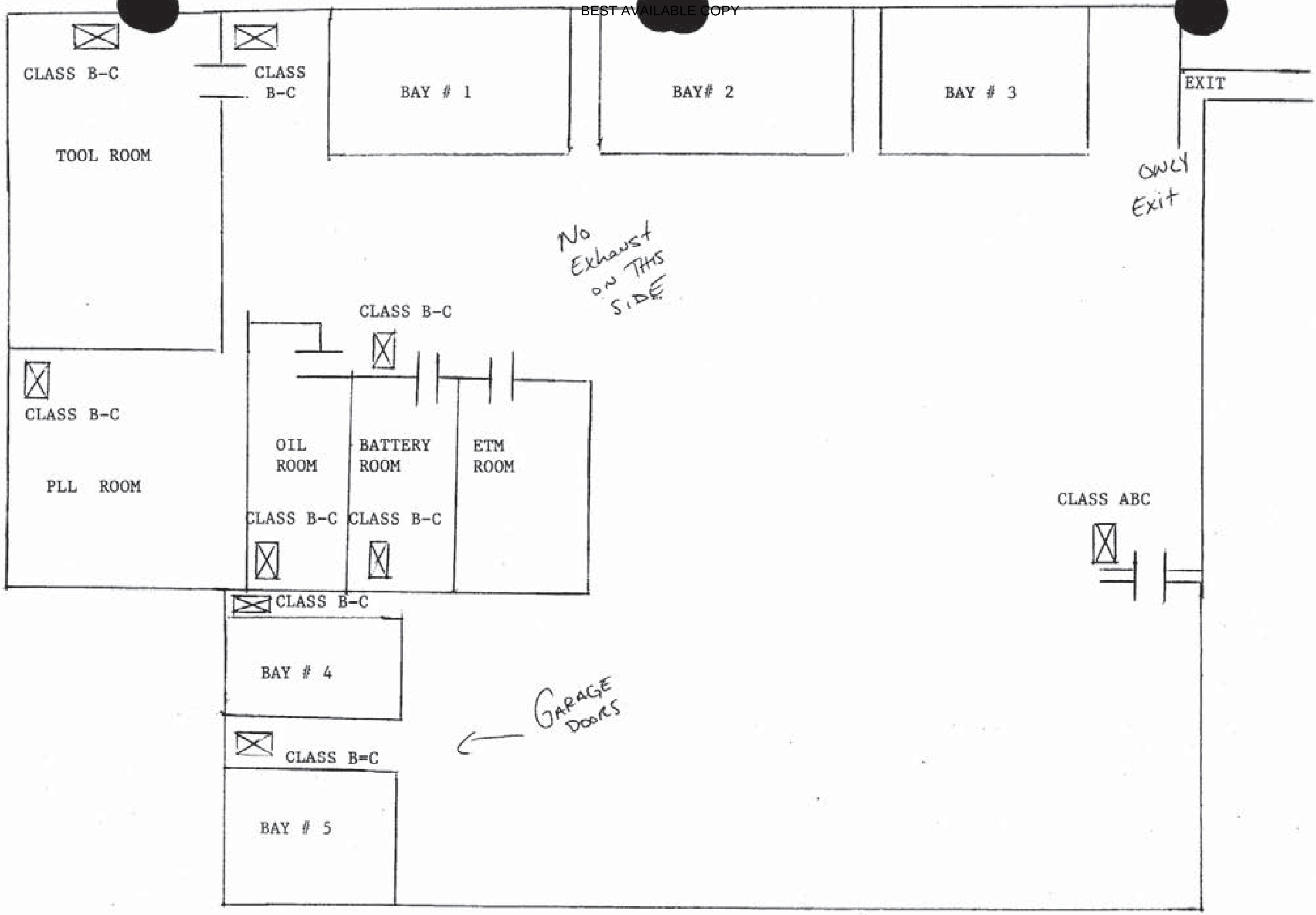
OMS # 10 FIRE EXTINGUISHER LOG



NOTE: ☒ = EXTINGUISHER

CUMBERLAND OMS

MDARNG Facilities IH Baseline Surveys CPT Thomas Price Armory, Cumberland, MD
Project No. 55-ML-01ED-03

APPENDIX C

PHOTOGRAPHS

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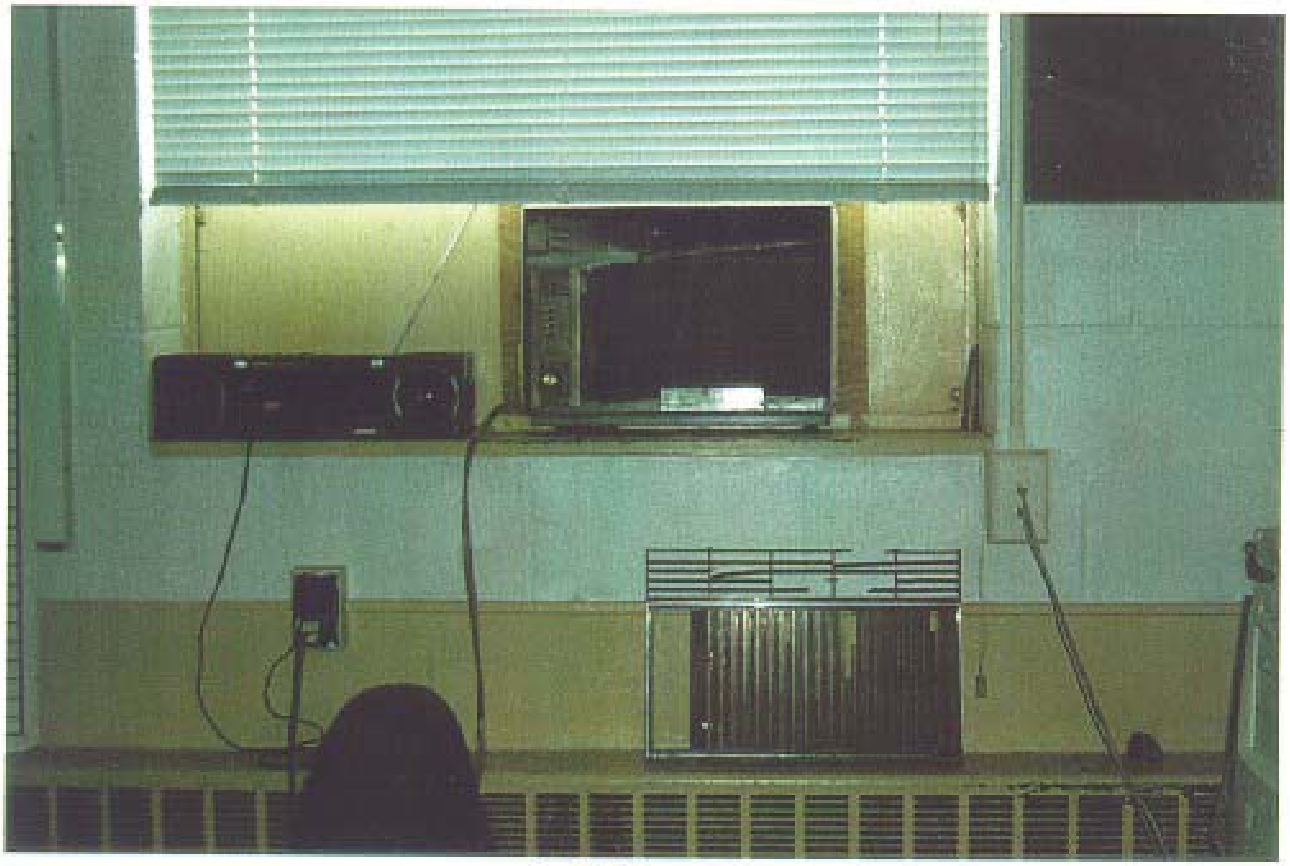
Photograph Number	Photograph Location
1546	Drill area near Room 113 and near water fountain
1549	Counter into kitchen area from drill area
1550	SFC Non-Responsive [redacted] Office- Window sill under AC unit
1551	Desktop in SFC Non-Responsive [redacted]s Office
1552	Floor where baffle used to be in former IFR
1553	Floor midpoint of IFR lanes
1554	Desk in front of former IFR
1555	Supply office Room 122 desk
1556	Supply office Room 122 refrigerator top
1557	Supply Office Room 122 floor
1558	OMS office window sill under AC unit
1559	OMS office floor
1560	Maintenance area of OMS
1561	OMS area near lift On top of wall (1/2 wall)

1549

1546



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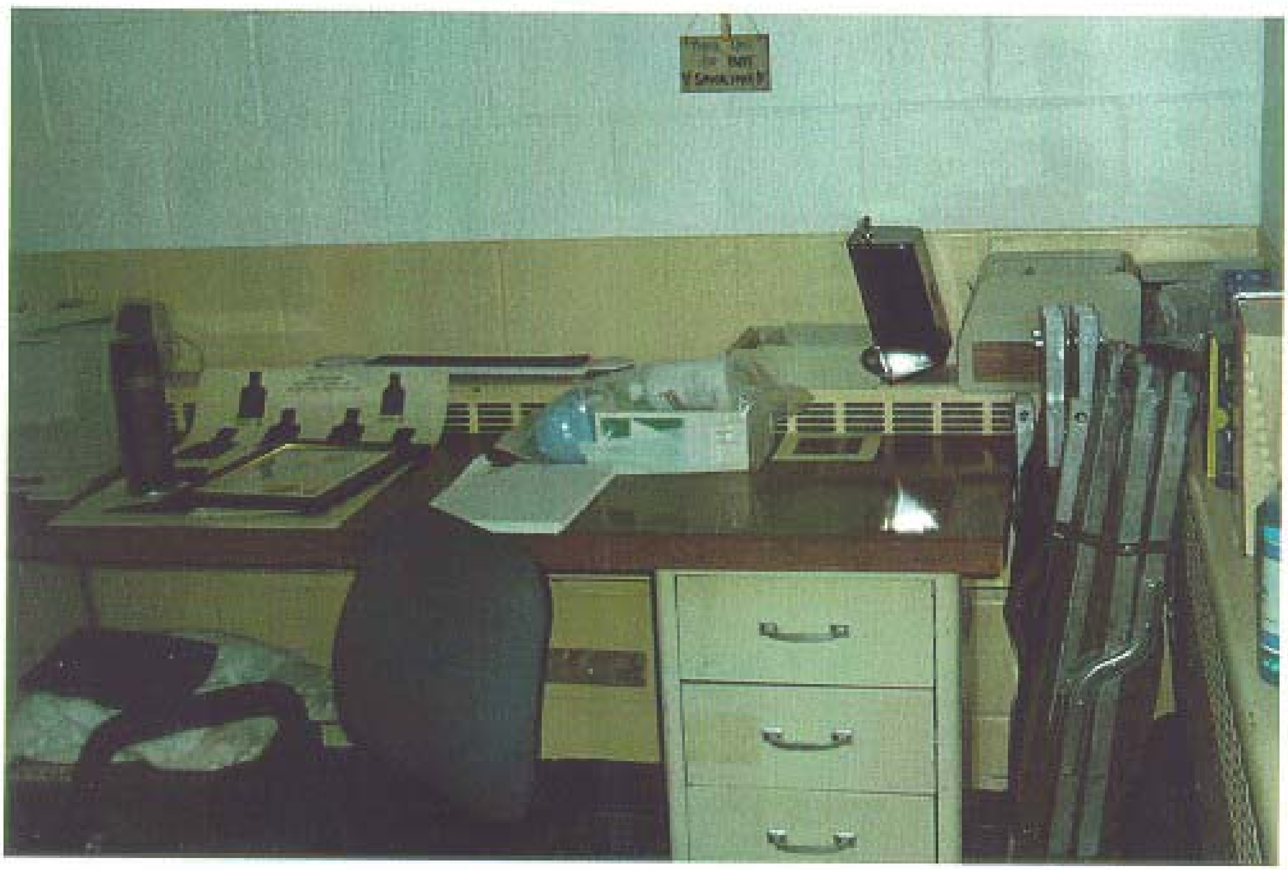

1551

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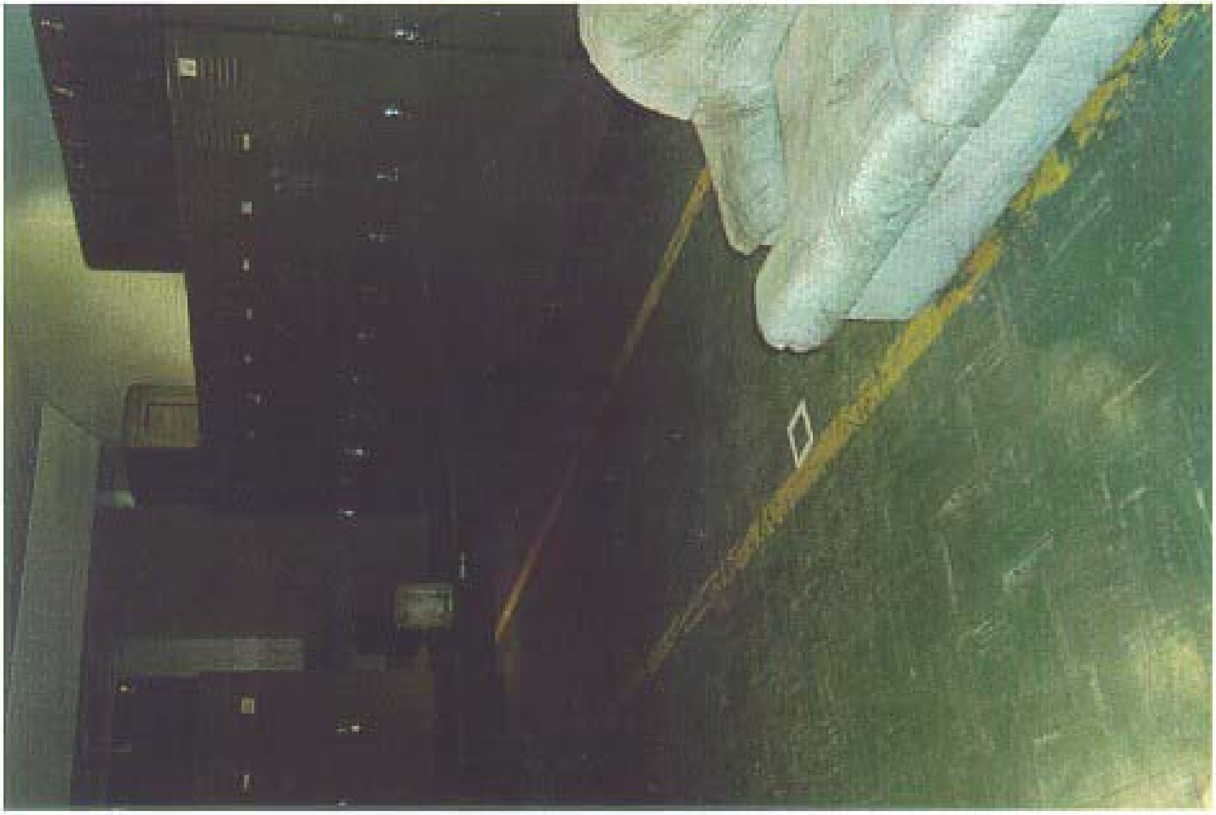

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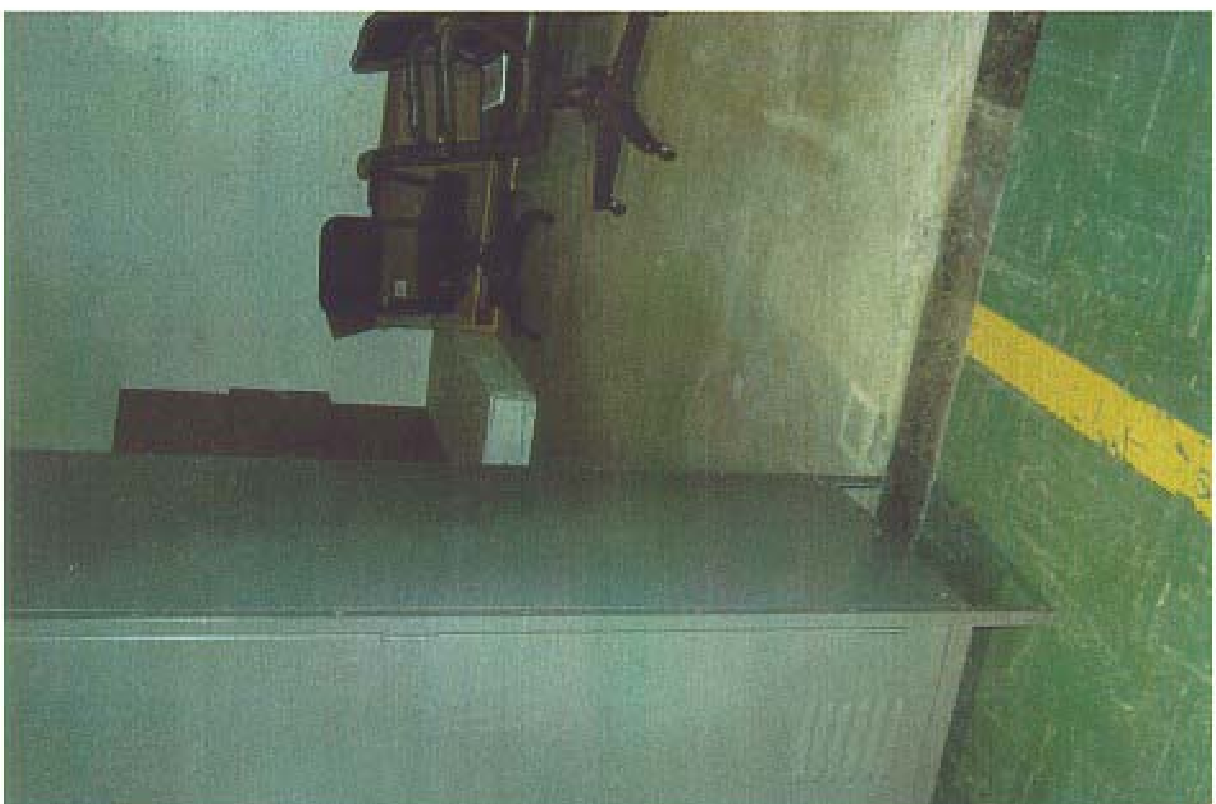

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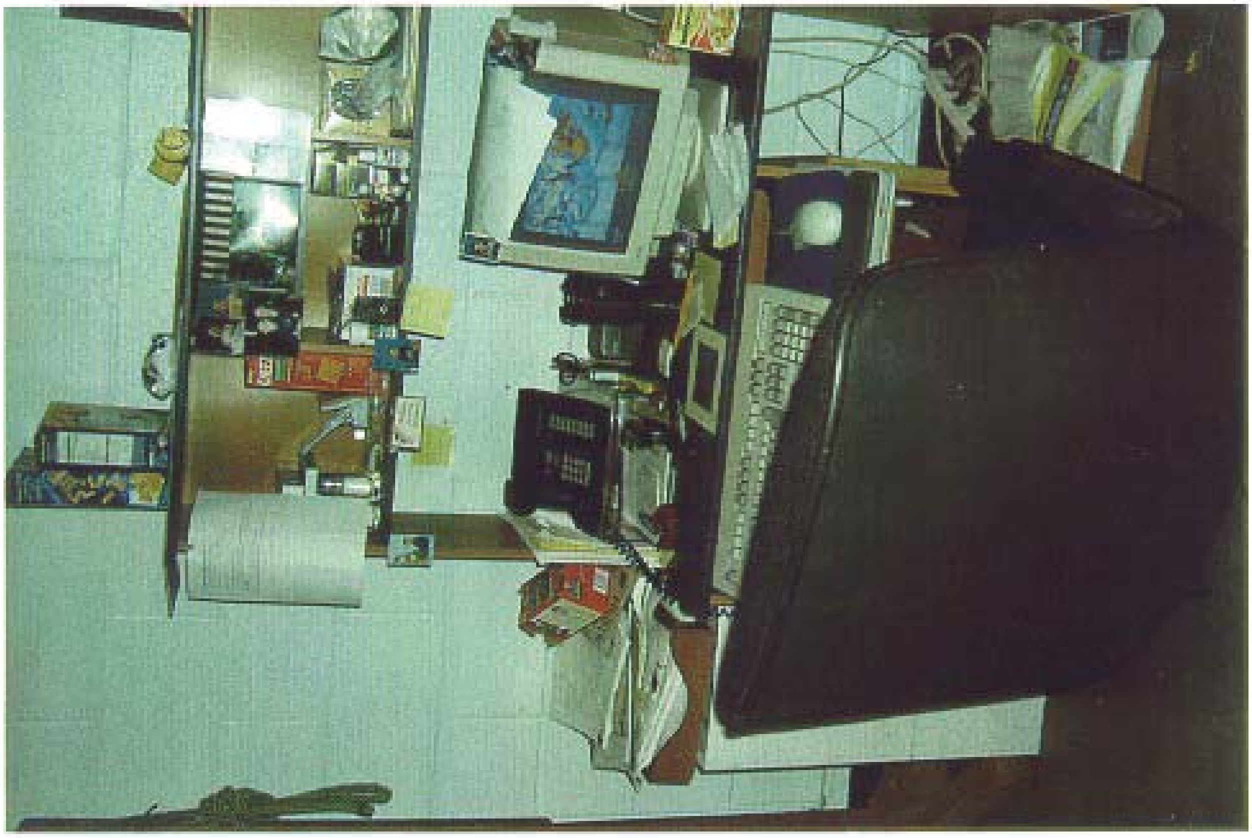

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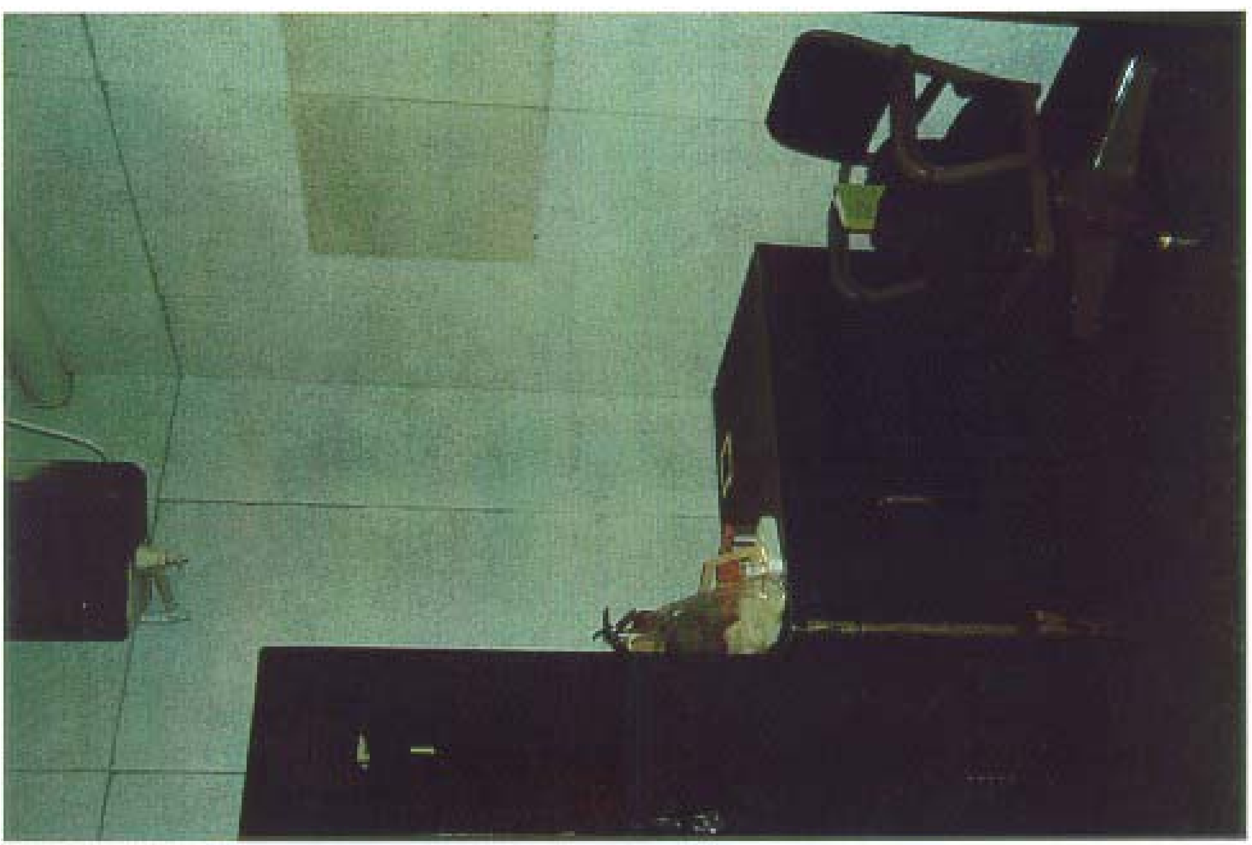

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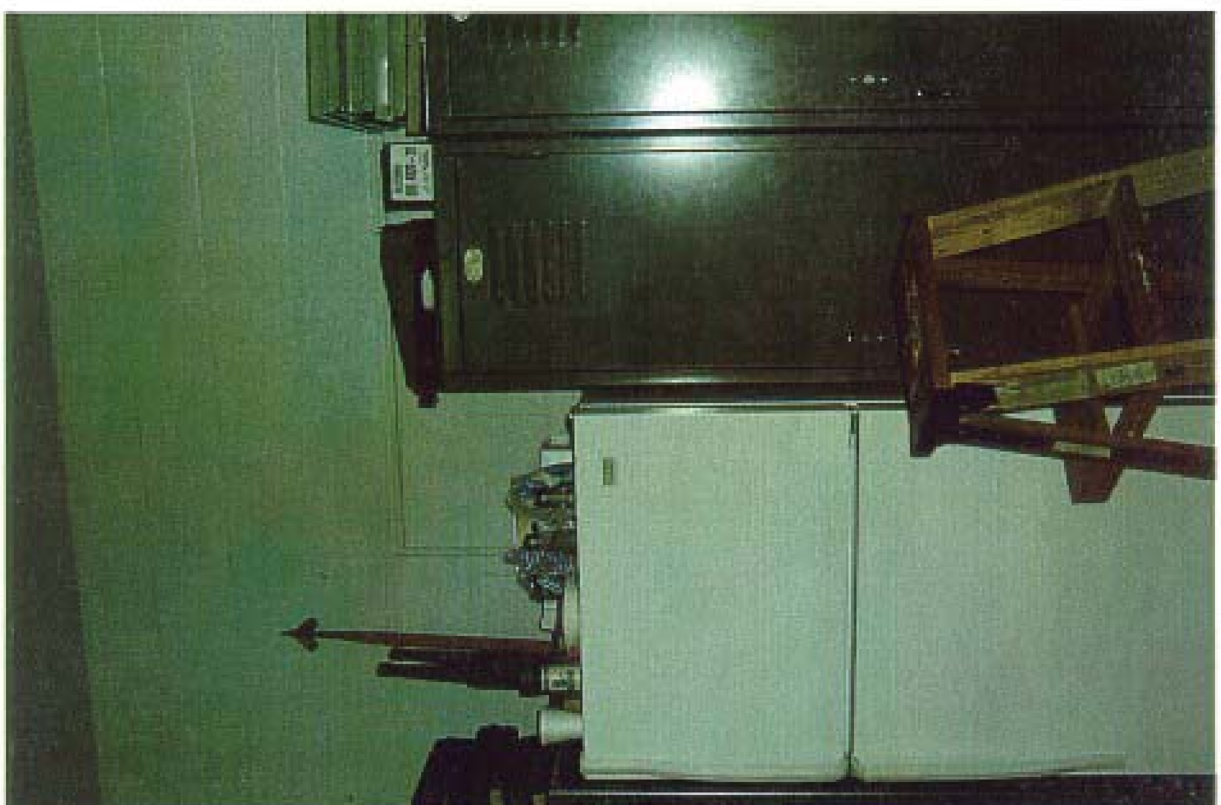

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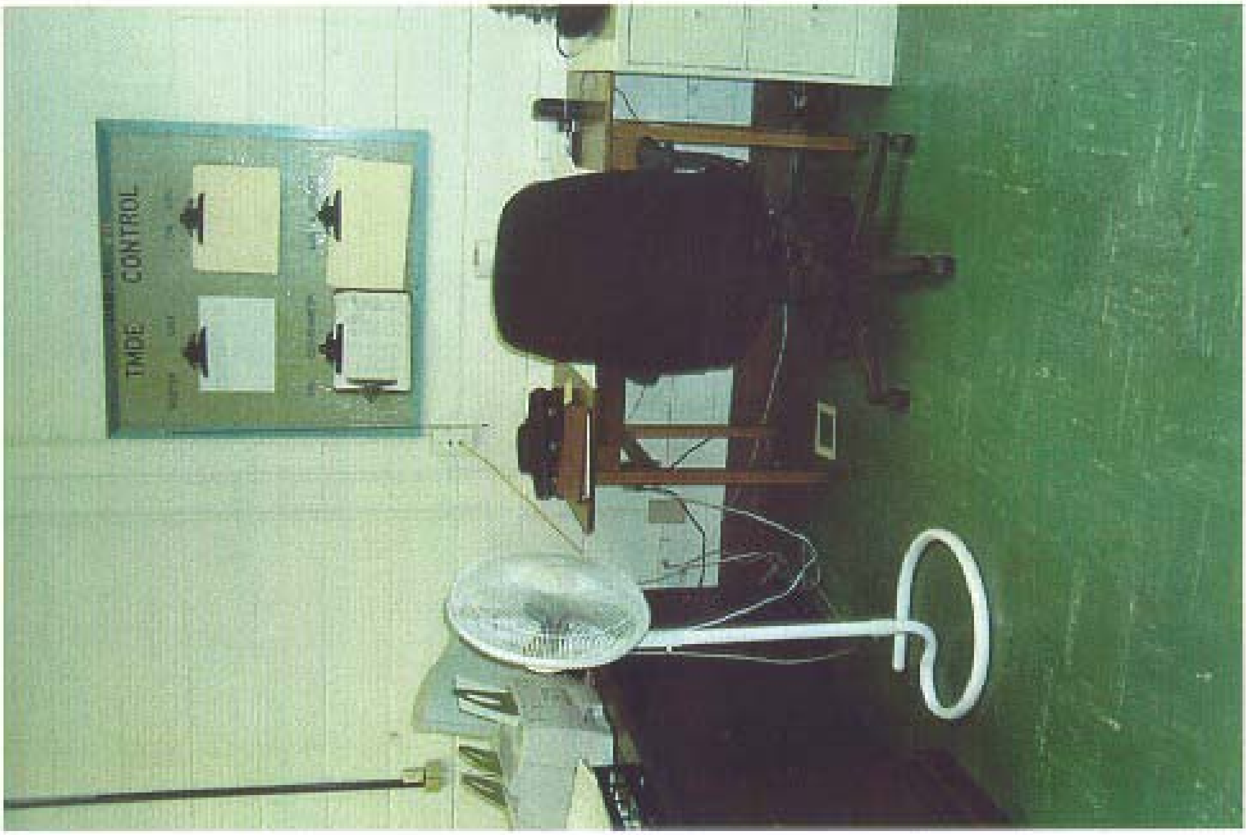

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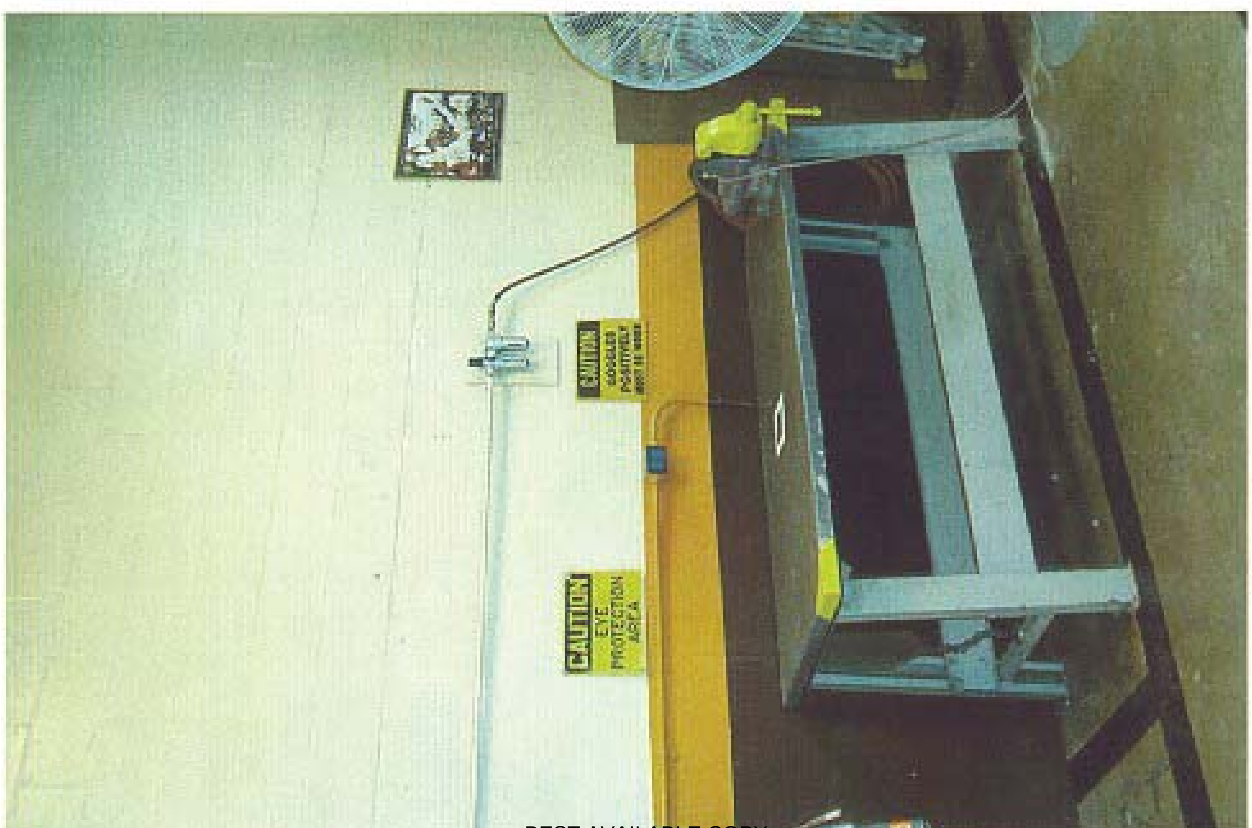

1560

MDARNG Facilities IH Baseline Surveys CPT Thomas Price Armory, Cumberland, MD
Project No. 55-ML-01ED-03

APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

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			Indoor Range Info					
Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (µg/ft²)
	Cumberland	Cumberland		Yes		Unknown		
CUW01	Cumberland	Cumberland					On wall in drill area near Room 113; near water fountain	<12
CUW02	Cumberland	Cumberland					On counter for kitchen area onto drill area	<110
CUW03	Cumberland	Cumberland					On window sill under AC unit in SFC [redacted] office	<110
CUW04	Cumberland	Cumberland					On desktop in SFC [redacted]s office	<110
CUW05	Cumberland	Cumberland					On floor in former IFR baffle area	<110
CUW06	Cumberland	Cumberland					On floor midpoint of IFR lanes	3,500
CUW07	Cumberland	Cumberland					On desk in front of old IFR	<110
CUW08	Cumberland	Cumberland					Room 122 on desk of supply SGT's office	<110
CUW09	Cumberland	Cumberland					Room 122 on top of refrigerator in supply office	<110
CUW10	Cumberland	Cumberland					Room 122 on floor in supply office	<110
CUW11	Cumberland	Cumberland					On window sill in OMS office under AC unit	<110
CUW12	Cumberland	Cumberland					On floor in OMS office	<110
CUW13	Cumberland	Cumberland					On desktop in maintainence area of OMS	<110
CUW14	Cumberland	Cumberland					On top of wall in OMS area near lift	<110

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Client:	National Guard Bureau	**Job Name:**	Cumberland National Guard Armory	**Chain Of Custody:**	116955
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Analyzed:**	08/28/2003
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	29-Aug-03
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Final Result			Comments
0365493	CU Blank 01	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0365494	CU W01	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0365495	CU W02	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0365496	CU W03	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0365497	CU W04	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0365498	CU W05	Flame	Wipe	****	0.108	111.52	ug/ft²		2000	ug/ft²	
0365499	CU Blank 02	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0365500	CU W06	Flame	Wipe	****	0.108	111.52	ug/ft²		3500	ug/ft²	
0365501	CU W07	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0365502	CU W08	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0365503	CU W09	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0365504	CU W10	Flame	Wipe	****	0.108	111.52	ug/ft²		990	ug/ft²	
0365505	CU W11	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0365506	CU W12	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0365507	CU W13	Flame	Wipe	****	0.108	111.52	ug/ft³	<	110	ug/ft²	
0365508	CU W14	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	

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	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	29-Aug-03
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

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Analyst: Daniel P. Swanson **Technical Manager:** G Edward Carney

DATA CHEM LABORATORIES, INC.

Submitted To: [redacted]
Commander, USACHPPM
5158 Blackhawk Road, Attn: MCHB-TS-OFS
APG, MD 21010-5403

Reference Data:	**Lead**
Client Sample No.:	CUAS01 through CUBlank02
P.O. No.:	Not Available
Sample Location:	Cumberland NG Armory
Sample Type:	Filter
Method Reference:	NIOSH 7300
DCL Set ID No.:	03-S-4146
DCL Sample ID No.:	03-25409 through 03-25414
Sample Receipt Date:	8/27/2003
Preparation Date:	08/27/03
Analysis Date:	08/27/03

The samples were prepared and analyzed in accordance with NIOSH method 7300 using a Perkin Elmer 3000XL ICP.

The sample condition upon receipt was acceptable except where noted.

The results are in the enclosed data table. Results relate only to the items tested and are not blank corrected unless indicated in the table.

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[redacted]
Analyst

[redacted]
Reviewer

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4388 GLENDALE-MILFORD ROAD
CINCINNATI, OHIO 45242-3706
513 733-5336, FAX 513 733-5347

WEST COAST OFFICE
11 SANTA YORMA COURT
NOVATO, CALIFORNIA 94945
800 280-8071, FAX 415 893-9469

Results
Lead

Client #	DCL #	Sample Volume (L)	µg/sample	mg/m^3
CUAS01	03-25409	209.0	ND	<0.005
CUAS02	03-25410	221.1	ND	<0.005
CUAS03	03-25411	215.8	ND	<0.005
CUAS04	03-25412	233.2	ND	<0.004
CUBlank01	03-25413	0	ND	-
CUBlank02	03-25414	0	ND	-
	Prep Blank		ND	
% Recovery	LCS		101.	
RPL			**1.**	

ND = not detected at or above the reporting limit (RPL).
LCS = laboratory control sample.

[redacted]
Analyst

[redacted]
Reviewer

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ANALYTICAL REQUEST FORM

☐ REGULAR Status (5 working days from receipt)

☒ RUSH Status Required - ADDITIONAL CHARGE

RESULTS REQUIRED BY 27 AUGUST 2003
DATE

CONTACT DATACHEM LABS PRIOR TO SENDING SAMPLES

Date ______ Purchase Order No. ______

Company Name

Address COMMANDER, USACHPPM ATTN: MCHB-TS-OFS 5158 BLACKHAWK ROAD APG, MD 21010-5403

City

Person to Contact Non-Responsive [redacted]

Telephone (410) 436-5475

Fax Telephone (410) 436-5471

Billing Address (if different from above)

Quote No. ______

Sample Collection

Sampling Site Cumberland NG Armory

Industrial Process NGB ARMORY

Date of Collection 20 Aug 03

Time Collected ______

Date of Shipment ______

QC Requi Non-Responsive [redacted]

Collector's [redacted]

Signature [redacted]

REQUEST FOR ANALYSES 03-S-4146

Laboratory Use Only	Client Sample Number	Media Type*	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
03-25409	CUAS01		209.0	LEAD NIOSH 7300
25410	CUAS02		221.1	LEAD NIOSH 7300
25411	CUAS03		215.8	LEAD NIOSH 7300
25412	CUAS04		233.2	LEAD NIOSH 7300
25413	CUBLANK01			
25414	CUBLANK02			

CHAIN OF CUSTODY

Re (Si Non-Responsive [redacted]	Date / Time 22 AUG 03	Received by: (Signature) [signature]	Date / Time 8/27/03 10:10
Re (Si [redacted]	Date / Time	Received by: (Signature)	Date / Time

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Client:	National Guard Bureau	**Job Name:**	Cumberland National Guard Armory	**Chain Of Custody:**	116955
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	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	28-Aug-03
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

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0365493	CU Blank 01	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
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0365497	CU W04	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
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	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	28-Aug-03
Attention:	[redacted]				

Page 2 of 2

Summary of Atomic Absorption Analysis for Lead

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Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Analyst: Daniel P. Swanson **Technical Manager:** G Edward Carney

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DATA CHEM LABORATORIES, INC.

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Commander, USACHPPM
5158 Blackhawk Road, Attn: MCHB-TS-OFS
APG, MD 21010-5403

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[redacted]
Analyst

[redacted]
Reviewer

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CINCINNATI, OHIO 45242-3706
513 733-5336, FAX 513 733-5347

WEST COAST OFFICE
11 SANTA YORMA COURT
NOVATO, CALIFORNIA 94945
800 280-8071, FAX 415 893-9469

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CUBlank01	03-25413	0	ND	-
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	Prep Blank		ND	
% Recovery	LCS		101.	
RPL			1.	

ND = not detected at or above the reporting limit (RPL).
LCS = laboratory control sample.

Non-Responsive [redacted]
Analyst

Non-Responsive [redacted]
Reviewer

DATA CHEM LABORATORIES, INC.

ANALYTICAL REQUEST FORM

☐ REGULAR Status (5 working days from receipt)

☒ RUSH Status Required - ADDITIONAL CHARGE

RESULTS REQUIRED BY 27 AUGUST 2003
DATE

CONTACT DATACHEM LABS PRIOR TO SENDING SAMPLES

Date ______ Purchase Order No. ______

Company Name

Address COMMANDER, USACHPPM ATTN: MCHB-TS-OFS 5158 BLACKHAWK ROAD APG, MD 21010-5403

City State Zip

Person to Contact [redacted]

Telephone (410) 436-5475

Fax Telephone (410) 436-5471

Billing Address (if different from above)

Quote No. ______

Sample Collection

Sampling Site Cumberland NG Armory

Industrial Process NGB ARMORY

Date of Collection 20 Aug 03

Time Collected ______

Date of Shipment ______

QC Requirements ☐ Standard ☐ Other ______

Collector's [redacted]

Signature

REQUEST FOR ANALYSES 03-S-4146

Laboratory Use Only	Client Sample Number	Media Type*	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
03-25409	CUAS01		209.0	LEAD NIOSH 7300
25410	CUAS02		221.1	LEAD NIOSH 7300
25411	CUAS03		215.8	LEAD NIOSH 7300
25412	CUAS04		233.2	LEAD NIOSH 7300
25413	CUBLANK01			
25414	CUBLANK02			

CHAIN OF CUSTODY

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[redacted]	22AUG03	KYockey	8/27/03 10:10
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time

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APPENDIX E

REFERENCES

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APPENDIX E

REGULATIONS AND STANDARDS

1. Title 29, Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration, current ed. http://www.osha.gov/comp-links.html.

2. Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program, August 19, 1998. http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf.

3. AR 40-5, Medical Service, Preventive Medicine, 15 October 1990. http://www.usapa.army.mil/pdffiles/r40_5.pdf.

4. AR 385-10, The Army Safety Program, 29 February 2000. http://www.usapa.army.mil/pdffiles/r385_10.pdf.

5. DA PAM 40-503, Medical Services, Industrial Hygiene Program, 30 October 2000. http://www.usapa.army.mil/pdffiles/p40_503.pdf.

6. Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs), American Conference of Governmental Industrial Hygienists (ACGIH), current ed.

7. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 62-2002, Ventilation for Acceptable Indoor Air Quality.

8. RP-1-1993, Office Lighting, ANSI/ESNA.

APPENDIX F

LEAD CLEANING GUIDANCE

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CHAPTER 14: CLEANING

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Step-by-Step Summary

Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
3. Have sufficient cleaning equipment and supplies *before* beginning work.
4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
13. Paint or otherwise seal treated surfaces and interior floors.
14. Conduct a clearance examination (see Chapter 15).
15. If clearance is not achieved, repeat the final cleaning.

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Step-by-Step Summary (continued)

16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.
17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.
18. Cleaning equipment list:
    - HEPA vacuums.
    - Detergent.
    - Waterproof gloves.
    - Rags.
    - Sponges.
    - Mops.
    - Buckets.
    - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
    - 6-mil plastic bags.
    - Debris containers.
    - Waste water containers.
    - Shovels.
    - Rakes.
    - Water-misting sprayers.
    - 6-mil polyethylene sheeting (or equivalent).

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Chapter 14: Cleaning

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris *and* dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?
- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

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C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

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Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards *and* were properly separated from work

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1720 Walton Road Blue Bell, PA 19422 610-828-3078 Fax 610-828-7842

February 16, 2009

E-MAIL
Ms. [redacted]
Army National Guard
ATTN: NGB-ARS-IHNE
301-IH Old Bay Lane
Havre de Grace, MD 21078

Subject: Industrial Hygiene Assessment Report
Cumberland Readiness Center, Cumberland, Maryland 21502
IES Project No. EHS08794.02

Dear [redacted]

IES Engineers (IES) is pleased to enclose the final report of the Industrial Hygiene assessment conducted at the Army National Guard Readiness Center facility located in Cumberland, Maryland. Thank you for the opportunity to perform this assessment. Should you have any questions, please contact [redacted] or me.

Sincerely,

[redacted] /e/
[redacted], CIH
Senior Manager, Health, Safety
& Industrial Hygiene Services

cc: [redacted], IES

NATIONAL GUARD BUREAU
REGION NORTH INDUSTRIAL HYGIENE OFFICE
HAVRE DE GRACE, MARYLAND

FINAL
INDUSTRIAL HYGIENE ASSESSMENT
CUMBERLAND READINESS CENTER
1100 BROWN AVENUE, CUMBERLAND, MARYLAND, 21502
SURVEY DATE: JULY 24, 2008

IES PROJECT NO. EHS08794.02
REPORT DATE: FEBRUARY 16, 2009

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APPENDICES

1.0 EXECUTIVE SUMMARY

1.1 Introduction

Assessment Date: July 24, 2008

Purpose: The National Guard Bureau (NGB) retained IES Engineers (IES) to assist in performing an Industrial Hygiene assessment at the Army National Guard (ARNG) Readiness Center (RC) located at 1100 Brown Avenue in Cumberland, Maryland (Captain Thomas Price Armory). The purpose of the Industrial Hygiene survey was to identify and measure the existence and extent of potentially hazardous operations or conditions at the ARNG Cumberland RC facility. Mr. [redacted], CIH, Senior Project Manager of IES, performed the assessment. Assessment activities were conducted with reference to the Statement of Work – Industrial Hygiene Services for National Guard Bureau Industrial Hygiene Region North Baseline Surveys for Readiness Centers and Administrative Buildings, May 2008, and included:

1) Dust sampling and analysis for lead surface contamination,
2) Air sampling and analysis for lead (to determine administrative personnel exposure to airborne lead),
3) Bulk sampling of suspected asbestos-containing building materials, or lead-containing paint (where advised),
4) Physical (visual) site inspection of all internal building areas to note condition of materials, particularly those suspected to be lead or asbestos-containing, as well as potential water-damaged materials, housekeeping conditions and related safety hazards, ergonomic considerations, and indicators of indoor air quality.
5) Measurements of relative humidity, carbon dioxide and temperature in occupied areas of each floor, as well as lighting supporting evaluation with respect to indoor environmental standards,
6) Visual inspection and/or measurement of ventilation systems within the readiness center (general and local exhaust), as pertinent, supporting evaluation of indoor air quality and maintenance procedures,
7) Evaluation of attached garages, within the scope of readiness center operations, with respect to visual examination, hazards present, and observation/documentation of controls utilized including administrative, personal protective equipment and ventilation controls, and associated impact upon readiness center operations.

Conferred With: SFC David Myers, Administrative Supervisor, Cumberland RC

1.2 Facility Description

The Cumberland RC is located at 1100 Brown Avenue, Cumberland, Maryland, and is primarily designed and operated as a 25,922 square foot training facility, which includes an upstairs section (19,162 square feet), basement (4,480 square feet), and basement garage (2,280 square feet). The Cumberland RC principally houses the 243rd Engineers Company, 729th Support Batallion. Readiness Center Operations provides training, training support and administrative support to the Army National Guard. Predominant construction features of the facility include interior and exterior block masonry walls on concrete slab with brick exterior cladding, and insulated metal pan roof structure. Interior finishes included 12 inch square (12" x 12") floor tile, 9 inch square (9" x 9") floor tile, or masonry tile floors, suspended fiber acoustic ceiling tile (2'x2'), and painted drywall partitions.

The RC includes: lobby, supply room and storage, men's and women's locker rooms, men's and women's restrooms, fitness center, kitchen, administrative office block, meeting room, computer learning center, distance learning center, platoon, NCO and old signal command offices. The basement floor includes: co-ed locker facility, restrooms, lounge area, recruiter office, Field Maintenance Support (FMS) offices, and separate attached garage facility (managed wholly by FMS unit), and boiler room/caretaker's office-storage area.

The facility is heated, ventilated, and/or air-conditioned by varied systems. Air-conditioning is supplied through portable units positioned at windows. Separate localized exhaust ventilators are located in the drill room exterior walls. Gas-fired heating units serve the drill room. Each restroom and locker area is local-exhaust ventilated. A boiler/circulating hot water heating system is used for heating throughout most of the facility, whether via localized heaters/fan coil units, or wall mounted registers. Certain gas/oil-fired radiant heaters are located in the maintenance (garage) bays.

The facility is occupied by 12 full-time personnel. The full-time complement includes: two active guard reserve, two recruiters, and one administrative support. Three state workers include a full-time caretaker, part-time caretaker, and one person serving the computer lab. In addition, there are six personnel assigned to the FMS #9 unit. Normal scheduled work operations occur Tuesday through Friday, between the hours 0630 to 1700. Training at the facility occurs monthly on weekends. On the day of the IH assessment, the facility was fully occupied by assigned personnel.

<u>Field Maintenance Shop (FMS #9)</u>
A maintenance/garage section is incorporated into this facility, connected to the basement. The FMS #9 is a separately operated Unit, located at the Cumberland RC facility.

Please refer to Appendix A of this report for current photographs of facility areas/conditions. Refer to subsequent report sections 1.3 – Key Findings and Conclusions, and 2.0 – Operation Description and Condition for further information.

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1.3 Key Findings and Conclusions

Several key findings and conclusions were noted as follows:

<u>HVAC/Ventilation-Related Service</u>

- Men's Locker Room/Restroom exhaust fan system was not operational during the survey. A noticeable musty odor was present.
- An abandoned HVAC ventilation ductwork was found in the basement. However, RC personnel do not know the source of this duct, since there are no central HVAC currently operational.
- Women's Restroom exhaust fans were not operational during the survey.
- The boiler/hot water heating valve-distribution system is no longer functional. Localized temperature control is presently limited. Circulating water pumps are presently being re-built.
- The Cumberland RC recently purchased several "drainless" portable air-conditioning units. The units are installed in the room space with vents to outdoors. They reportedly operate without condensate drainage from cooling coils. These units should be carefully monitored, and the design process further reviewed to verify no unforeseen hazards may arise from operation.

<u>Other Ventilation</u>

- Kitchen vent hoods serving stove and automatic dishwashing equipment were found operational. The kitchen is not routinely operated. Some water leakage was noticed on the floor beneath a refrigerator.
- Retractable vehicle exhaust ventilation ducts and hoods are located in the long maintenance service (garage) bays, and were found operational.

<u>Facility Condition</u>

- New windows have been installed throughout the armory; windows may be opened for natural ventilation.
- The supply storage areas were found with materials stacked on floors in area, with some potential housekeeping/safety hazards.
- The boiler chemical treatment program was found managed by off-site personnel.
- The boiler room was found with some delaminating paint from floor and hot water system valves. All boiler breeching insulation appeared intact, and in good condition.
- Excessive items were found stored in the caretaker's office/storage area. A flammable storage cabinet was found blocked by boxes and articles.
- Nine inch square floor tile was found throughout the facility (estimated to cover approximately two-thirds of facility floors, except basement renovated areas, and drill hall). This floor tile type is commonly known to contain asbestos, and should be treated as presumed asbestos-containing material. Asbestos-containing floor tile should be managed according to an Operations and Maintenance Plan. Certain floor areas are reportedly cleaned with hot water but not waxed. This condition is not anticipated to properly protect the floor tile from degradation, or limit minor fiber release.
- Twelve inch square floor tile (in good condition) was found to replace 9 x 9 square inch floor tile in basement areas, reportedly renovated in conjunction with removal of the old firing range.

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- Thermal system insulation was reportedly replaced with fiberglass insulation materials. Currently visible materials appear to be fiberglass, in good condition.
- Some minor paint delamination at kitchen and boiler room floors was observed.
- Ceiling plaster was found slightly delaminated at the Women's restroom (near supply storage), due to apparent water leak. The area was found dry, and has reportedly been repaired. The plaster was sampled and reported with "no asbestos detected".
- A kitchen fire extinguisher was found out of inspection (last inspected May 2007).

<u>Sampling Results</u>

- A ceiling plaster sample collected from damaged plaster (finish layer) in women's restroom and subsequently analyzed and reported with "no asbestos detected".
- Surface dust samples were collected throughout various locations of the facility, with certain surface dust concentrations found to exceed the 200 $\mu g/ft^2$ OSHA guideline for maintenance of surface cleanliness. The extent of the low level contamination should be further determined, followed by appropriate clean-up action, where necessary.
- Bulk paint samples were collected in the kitchen (floor paint), and boiler room (floor and valve paint). All samples were reported by the analyzing laboratory with lead content less than the lead-containing threshold (0.5%). Standard maintenance practices are advised.

<u>Water Leaks</u>

- No water leaks were evident during the survey, except for the ceiling leak previously noted in the women's restroom.

<u>EH&S Compliance & Support</u>

- Caretaker is required to order cleaning and chemical products through the Pikesville Armory, "Garage 13". Product delivery may not be timely, in limited quantities; therefore, localized purchasing may occur. Material safety data sheets are not secured during these purchases.
- Current, up-to-date MSDS were not found on-site for all chemical products in Caretaker's storage. Caretaker utilizes personal protection only to extent that such protection is voluntarily used (i.e. hearing protectors or glove protection may be used during chemical use, though no particular glove types were reported to be specified for certain jobs.
- Flammable and combustible storage cabinets were found in main garage bay. Flammable and combustible contents may be interchangeably stored in the respective cabinets.
- An outdoor portable truck wash/recycling system was observed on-site, in addition to other hazardous material storage (clean and separate waste oil, clean and waste anti-freeze, etc). System maintenance is managed by FMS 9 personnel, and is not monitored or used by readiness center personnel.

Illuminance Levels

- The average illuminance levels in several areas throughout the facility were found less than the Army National Guard recommended values. Although the lower-than-recommended lighting levels found are not expected to present an imminent hazard, proper lighting levels promote safe work and may reduce ergonomic stressors.

1.4 Recommendations

IES' recommendations resulting from this assessment, including the determination of the Risk Assessment Code (RAC) for occupational exposures, are included in a separate document entitled, "Cumberland_RC_08_Recommendations."

2.0 OPERATION DESCRIPTION & CONDITION

INSTALLATION: RC Army National Guard
BUILDING: 1100 Brown Avenue, Cumberland, Maryland, 21502
LOCATION: Facility-wide

2.1 General Description & Condition

OPERATION DESCRIPTION: On the day of the assessment, IES observed routine operations in progress. Unit operations at the Cumberland RC facility include:
1) 243rd Engineers Company (EC) – Routine operations include administration, planning, supply, training preparation and associated training support and recruiting. The 243rd EC operation does not utilize the garage/vehicle maintenance facilities at this site. These are managed and operated by FMS #9. The Caretaker provides minor maintenance and custodial support for this facility. This includes cleaning interior facilities, floors and windows, minor repairs, changing light bulbs, minor floor maintenance, and outdoor grounds-keeping.
2) Distance Learning Center – Support for professional training and troop development.
3) FMS# 9 – Provides vehicle maintenance support for the region.

NOTE: Survey assessment activities were focused primarily on Readiness Center operations. General information was collected for FMS 9 operations, since these operations are separately managed, and not part of Cumberland Readiness Center operations.

GENERAL FACILITY CONDITION: The general facility condition was found to be in fair to good condition, also reflecting the earlier construction for the facility.

2.2 Specific Site Survey & Conditions

The site survey was conducted by Mr. [redacted], CIH, Senior Project Manager of IES, as coordinated by SFC [redacted], of the Hagerstown RC.

CHEMICAL AND PHYSICAL AGENTS SAMPLED:
Air Sampling and Analysis of Lead – Air sampling and analysis of lead was not completed due to inavailability of sample media at time of sampling (i.e., sample media shipped from the laboratory did not arrive on the date requested). LTC [redacted] was notified on the survey date. LTC [redacted] indicated that sampling and analysis will be conducted by the NGB at a later upcoming scheduled date.

Surface Lead Wipe Sampling and Analysis – 19 surface wipe samples were collected throughout the facility, at specified or randomly selected areas. Certain surface dust sample results were reported with lead concentration exceeding the OSHA guideline of 200 micrograms per square foot ($\mu g/ft^2$) for lead surface contamination in the workplace. This level was established to support housekeeping cleanliness in facilities required to establish written OSHA lead compliance programs, and may also be referenced as a threshold for general work area cleanliness. Horizontal surface dust sample results were found to exceed the 200 µg/ft^2 guideline for samples collected from the kitchen (heater vent fins), administrative office, library, supply storage room, men's locker room (exhaust vent surfaces), and stairwell near basement Maintenance office. Surface dust contamination at these locations was found to range between 210 – 530 µg/ft^2. These findings may reflect salient conditions; however, further surface dust sampling and analysis is advised, and follow-up cleaning as necessary. Surface cleaning should be conducted using wet-wiping and/or HEPA cleaning methods.

Bulk Sample Analysis (Lead Paint) – Facility paint was generally found in good condition. Bulk samples (paint chips) were collected from boiler room floor, and a boiler system valve for subsequent lead analysis. Sample results were reported as 0.079% lead (floor), and 0.02% (valve), and both samples indicate lead content less than 0.5% by weight, the criteria used to define "lead-based paint" by USEPA regulation.

Bulk Sample Analysis (Asbestos) – A ceiling plaster sample was collected from the women's restroom, in proximity to plaster damage due to a water leak. The sample was subsequently analyzed for asbestos content with reported results of "No Asbestos Detected."

Indoor Air Quality Measurement – General IAQ measurements (relative humidity, carbon dioxide, carbon monoxide and temperature) were made throughout the RC facility at 19 point locations, including maintenance/garage areas, supporting indoor air quality assessment.

Refer to report sections 1.3 – Key Findings and Conclusions, and 3.0 – Sample Results and Measurements for details, and to the document entitled: "Cumberland_RC_08_Recommendations" for further action.

VENTILATION/ HEATING, VENTILATING & AIR-CONDITIONING (HVAC) SYSTEMS: Ventilating systems were found as follows:

- Within the men's locker, and women's restroom, exhaust ventilation was found non-operational.
- The fitness center was found without mechanical exhaust ventilation.
- Several office areas were found with portable air-conditioning units, ducted to outdoors through modified window manifold (DeLonghi Pinquino - 11,000 BTU).
- The kitchen is equipped with an outdoor, ambient make-up air vent, to permit make-up air introduction when the kitchen door is closed. This duct system was found open and operational. The kitchen stove and dishwasher are local exhaust-ventilated to outdoors, and were found operational, with significantly noticeable airflow.
- The Caretaker, nor others at the facility have periodic HVAC inspection/service responsibility, and could not provide service records for review. No annual HVAC service records were available on-site, and the HVAC servicer, assigned at Pikesville Unit "Garage 13" is not readily accessible.

LIGHTING: The average luminance levels were collected throughout the facility, with certain locations found with illuminance levels less than ARNG recommended standards.

WATER DAMAGE: The facility was principally free of visible water damage. Water damage was evident in the women's restroom (near supply storage). The area was found dry, and has reportedly been repaired.

HOUSEKEEPING: In general housekeeping was found acceptable at the facility; however, the supply room/storage areas, and caretaker's storage area were found with considerable floor-stacked items. A flammable storage cabinet located in the caretaker's storage was blocked by stored articles. Excess stored materials should be removed from passageways to alleviate slip/trip/fall hazards, and to reduce potential fire hazards.

ERGONOMICS: No inherent ergonomic hazards were noted during the survey.

FMS 9/ATTACHED GARAGE: A detailed review of this operation was not completed, since this operation is not part of routine readiness center operations. The FMS 9 reportedly receives several periodic inspections and audits during the year by regulatory and other internal environmental, health and safety organizations.

A copy of IES' field notes from this assessment is included in a separate document entitled, "Cumberland_RC_08_Field_Notes." Please also refer to the determination of the Risk Assessment Code (RAC) for occupational exposures, included in the separate document entitled, "Cumberland_RC_08_Recommendations."

3.0 SAMPLE RESULTS AND MEASUREMENTS

3.1 Indoor Air Quality

Measurements of air temperature, relative humidity, carbon dioxide (CO_2), and carbon monoxide (CO) concentrations were collected using a calibrated direct reading hand-held TSI Q-Trak indoor air quality monitoring instrument. Sample results for CO were compared with the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) for exposure assessment purposes. TLVs are established through a peer review process, and are published annually in ACGIH's *TLVs and BEIs* booklet. The TLV's represent airborne exposure concentrations and conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. Due to wide variations in individual susceptibility, a small percentage of workers may experience discomfort or be affected by certain substances at concentrations below the recommended threshold limit.[(1)]

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Generally, measured levels of carbon dioxide (CO_2), carbon monoxide (CO), relative humidity (%RH), and temperature (F), were found within guidelines established by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, throughout building locations surveyed.

Refer to Table 1 – Air Temperature, Relative Humidity, CO_2 and CO Measurements for details of measured air temperature, relative humidity, CO_2, and CO collected throughout the building during the assessment.

Refer to Appendix B - Indoor Air Quality Sample Location Map detailing the IAQ measurement locations throughout the facility.

TABLE 1
AIR TEMPERATURE, RELATIVE HUMIDITY, CO_2, AND CO MEASUREMENTS

Location: Cumberland National Guard RC, Cumberland, Maryland
Date: July 24, 2008

Sample Location ID	Sample Location/Description	Nearest Sample Time	CO_2* (ppm)	CO (ppm)	Temperature (°F)	Relative Humidity (%RH)
Q1	Main Office	09:10	456	1.1	52	78
Q2	Library	09:15	467	1.9	54	79
Q3	Commanding Officer (office)	09:15	426	1.0	55	79
Q4	Lobby	09:40	520	1.3	55	78
Q5	Supply Room Storage	09:45	436	1.0	57	80
Q6	Supply Room (Large)	09:50	431	1.4	49	79
Q7	Men's Locker	10:00	428	--	52	79
Q8	Fitness Center	10:05	399	1.6	50	80
Q9	Kitchen	10:15	421	1.4	47	82
Q10	Drill Hall	10:40	409	1.0	51	80
Q11	Platoon Seargent Office	10:45	413	1.3	48	81
Q12	Distance Learning Center	11:00	429	1.1	48	81
Q13	Computer Learning Center	11:10	413	1.5	41	78
Q14	Meeting Room	11:20	400	1.0	45	80
Q15	Co-Ed Locker Room	11:40	414	1.2	51	77
Q16	Basement Lounge	12:00	636	1.0	45	73
Q17	Boiler Room	12:15	424	1.4	46	81
Q18	Maintenance Bay, long	12:30	360	1.0	48	76
Q19	Outdoors, parking lot	12:35	360	1.0	48	81

* CO_2 levels exceeding 700 ppm indicate occupancy. Higher levels identified may indicate inadequate air exchange.
** %RH levels > 60% may contribute to bioaerosol growth.

TABLE FOOTNOTES

Measurement device: All measurements collected in real-time using a TSI Q-Trak indoor air quality monitor, at approximately 4 feet above ground/floor height.

ppm Parts of contaminant per million parts of air. All CO_2 and CO concentrations expressed in ppm.

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Exposure Guidelines

CO_2	Indoor CO_2 concentrations should be maintained at less than 700 ppm above outdoor air levels – (ASHRAE 62.1-2007)[(2)]
CO	50 ppm (OSHA PEL-TWA); 25 ppm (ACGIH TLV-TWA)
Temperature	68 ºF to 79 ºF (ASHRAE 55-2004)[(3)]
Relative Humidity (%RH)	30% to 60% (ASHRAE 55-2004)[(3)]

3.2 Lead Dust Sampling

IES performed wipe sampling throughout facility areas of the RC and FMS 9, at specified and other selected locations. All wipe sampling was conducted according to best practices and guidelines published in Section II: Chapter 2, Sampling for Surface Contamination, of the OSHA Technical Manual. Wipe samples were collected over 100 cm^2 areas using pre-packaged, pre-wetted Ghost Wipes (Environmental Express). Surface dust samples were subsequently packaged and shipped to AMA Analytical Services of Lanham, Maryland for lead analysis according to Method EPA600/R-93/(200M)-7421. AMA maintains accreditation with the American Industrial Hygiene Association, and with the National Voluntary Laboratory Accreditation Program.

All wipe sample results were reported in micrograms of lead per square foot of surface sampled ($\mu g/ft^2$) for the purposes of this assessment, and for subsequent comparison with OSHA guideline criteria of 200 $\mu g/ft^2$.

A summary of analysis results are presented in Table 2 – Wipe Sampling Results Summary (Lead). Refer to Appendix C for the complete laboratory analysis results.

TABLE 2
WIPE SAMPLING RESULTS SUMMARY (LEAD)

Location: Cumberland National Guard RC, Cumberland, Maryland
Date: July 24, 2008

Sample ID	Location	Surface Area Sampled	Lead Surface Concentration ($\mu g/ft^2$)
CW-01	Basement, Co-Ed Locker, top of cabinets, horizontal surface composite (HSC)	100 cm^2	< 110
CW-02	Basement, Lounge, HSC	100 cm^2	< 110
CW-06	Kitchen, top of old refrigerator	100 cm^2	110
CW-07	Kitchen, heater vent fins	100 cm^2	480
CW-08	Kitchen, make-up air vent to outdoors	100 cm^2	< 110
CW-09	Drill Room/Assembly Hall, top of exit light	100 cm^2	< 110
CW-10	Platoon Sergeant Office, HSC	100 cm^2	< 110
CW-11	Distance Learning Office, HSC	100 cm^2	< 110
CW-12	Computer Learning Laboratory, HSC	100 cm^2	< 110
CW-13	Library (near Administrative Office), HSC	100 cm^2	530
CW-14	Administrative Office, HSC	100 cm^2	420

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Sample ID	Location	Surface Area Sampled	Lead Surface Concentration (µg/ft²)
CW-15	NE Stairwell, wall @ stair ledge, HSC	100 cm^2	< 110
CW-16	Women's Restroom, top of door	100 cm^2	160
CW-17	Supply Storage Room, HSC	100 cm^2	210
CW-18	Men's Locker Room, exhaust vent surfaces, HSC	100 cm^2	420
CW-19	Fitness Center, top of electric conduit near ceiling	100 cm^2	140
CW-20	Basement, Maintenance Bay, HSC	100 cm^2	< 110
CW-21	Basement, Stairwell near Maintenance Office, wall @ stair ledge, HSC	100 cm^2	280

TABLE FOOTNOTES

Collection procedure: Wipe sample collected with nitrile glove donned on hand, using 'Ghost Wipe' towlette, by sequential wipe using template or best estimate of 100 cm2 area; multiple passes with clean surface of wipe and subsequent folding, and placement to a labeled, sealed plastic vial or bag.

µg/ft2: Micrograms lead per square foot. Note: laboratory converts result from µg/100 cm^2 to µg/ft^2, prior to reporting.

< 1% Pb Less than 1% lead detected in sample results.

OSHA guideline standard for surface contamination by lead The USDOL/OSHA does not have a promulgated standard for lead surface contamination; however, OSHA has provided an interpretive level of 200 µg/ft^2 to assess the housekeeping requirement of "as free as reasonably practicable". This interpretation is presented in OSHA Industrial Hygiene Technical Manual (TED 01-00-0150; 1/20/1999), and in a letter of interpretation dated 01/13/2003, and subsequently issued into public domain.

3.3 Lead Paint Chip Sampling

IES observed certain deteriorating paint surfaces within the facility. Two paint chip samples were subsequently collected and shipped for analysis by AMA Analytical Services of Lanham, Maryland. Samples were analyzed for lead content according to the USEPA Method EPA600/R-93/(200M)-7421. All sample results were reported as percent lead for purposes of this assessment. According to the method, lead-based paint is defined as containing lead equal to or exceeding 1 milligram per square centimeter (mg/cm^2) or containing 0.5% by weight.

A summary of results are presented in Table 3 – Paint Chip Sampling Summary below. Refer to Appendix C for the complete laboratory analysis results.

TABLE 3
PAINT CHIP SAMPLING RESULTS SUMMARY (LEAD)

Location: Cumberland National Guard RC, Cumberland, Maryland
Date: July 24, 2008

Sample Number	Sample Location	Paint characteristic	Result (% Pb)
CW-04	Basement, Boiler Room, floor paint	Grey-Blue Paint	0.079
CW-05	Basement, Boiler Room, circulating water valve	White Paint	0.02

3.4 Asbestos Bulk Sampling

Ceiling plaster collected from the Women's restroom ceiling was submitted for analysis by AMA Analytical Services, a laboratory participating in the National Voluntary Laboratory Accreditation Program. Sample analysis was performed by polarized light microscopy according to USEPA method EPA/600R-93/116, with results reported as "No Asbestos Detected". Further sampling may be advised wherever major renovation or repair is completed, since plaster composition may vary depending on batch materials used.

A summary of analysis results are presented in Table 4 – Asbestos Bulk Sampling Results Summary. Refer to Appendix C for the complete laboratory analysis results.

TABLE 4
ASBESTOS BULK SAMPLING RESULTS SUMMARY

Location: Cumberland National Guard RC, Cumberland, Maryland
Date: July 24, 2008

Sample Number	Sample Location	Sample characteristic	Result (% Asbestos)
CW-22	Women's Restroom, plaster ceiling material, finish coat	Plaster layer	NAD *

* "NAD" No asbestos detected via polarized light microscopy – Analysis Method EPQ/600/R-93/116 dated Jul 1993.

3.5 Illuminance Survey

The illumination survey was performed pursuant to best Industrial Hygiene practices and the guidelines found in the ARNG document entitled, "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," dated November 17, 2007.[(4)] All measurements were made in slow response mode and were expressed in foot candles (fc). The measurements were used to calculate average illuminance levels for each workspace.

Based on the activities conducted in each workspace, the calculated average illuminance level was compared to the ARNG recommended illuminance values.

A table of illuminance measurements is presented in Table 5 – Illuminance Readings Summary. The data reported in this table represent the average illuminance readings from the accessible locations of the commonly occupied work areas of the facility.

Refer to Appendix D – Illuminance Readings Map for sample locations.

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TABLE 5
ILLUMINANCE READINGS SUMMARY

Location: Cumberland National Guard RC, Cumberland, Maryland
Date: July 24, 2008

Sample ID	Sample Description	Average Illuminance Measurements (fc)	ARNG Recommended Illuminance Value (fc)
I1	Main Office, table height (TH)	29	30-50
I2	NCO (Commanding Officer) Office	28	30-50
I3	Orderly Room	50	30-50
I4	First Sergeant's Office	56	30-50
I5	Retention NCO	46	30-50
I6	Lobby	4	10
I7	Supply Room Storage	23	30
I8	Large Supply Room	8	10
I9	Men's Locker	13	7
I10	Fitness Center	23	30
I11	Kitchen	26	50
I12	Drill Hall	20	10
I13	Platoon Sergeant's Office	20	30-50
I14	Distance Learning Center	27	30-50
I15	Computer Learning Center	28	30-50
I16	Meeting Room	17	30-50
I17	Copy Room	10	10
I18	Basement, Co-Ed Locker Room (drill weekends)	21	7
I19	Basement, Lounge	14	10
I20	Basement, Boiler Room	6	30
I21	Garage, Maintenance Bays	52	50

NOTES:
All illuminance measurements and recommended values are expressed in foot candles (fc), and were collected from approximate table height.

4.0 SAMPLING EQUIPMENT

Table 6 lists the sampling equipment that was used as a part of the assessment.

TABLE 6
SAMPLING EQUIPMENT LIST

Equipment Type	Make/Model	Equipment/Serial Number	Equipment Identification
Light Meter	International Light, IL1400A, illum. probe	3206/1782	R2373/3691
Indoor Air Quality Monitor	TSI Model 8554 Q-Trak	02071015	R10120

5.0 REFERENCES

1. ACGIH, *2008 TLVs and BEIs*.
2. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), Standard 62-2007, "Ventilation for Acceptable Indoor Air Quality," ASHRAE, Atlanta, Georgia, 2004.
3. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), Standard 55-2004, "Thermal Environmental Conditions for Human Occupancy," ASHRAE, Atlanta, Georgia, 2004.
4. "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," ARNG, 17 November 2007.
5. Occupational Safety and Health Administration, 29 CFR 1910.1025, Lead.

APPENDIX A

READINESS CENTER PHOTOGRAPHS

Photograph #1 – RC Lobby/Entry Area, view from entrance

Photograph #2 – Drill Hall, general view

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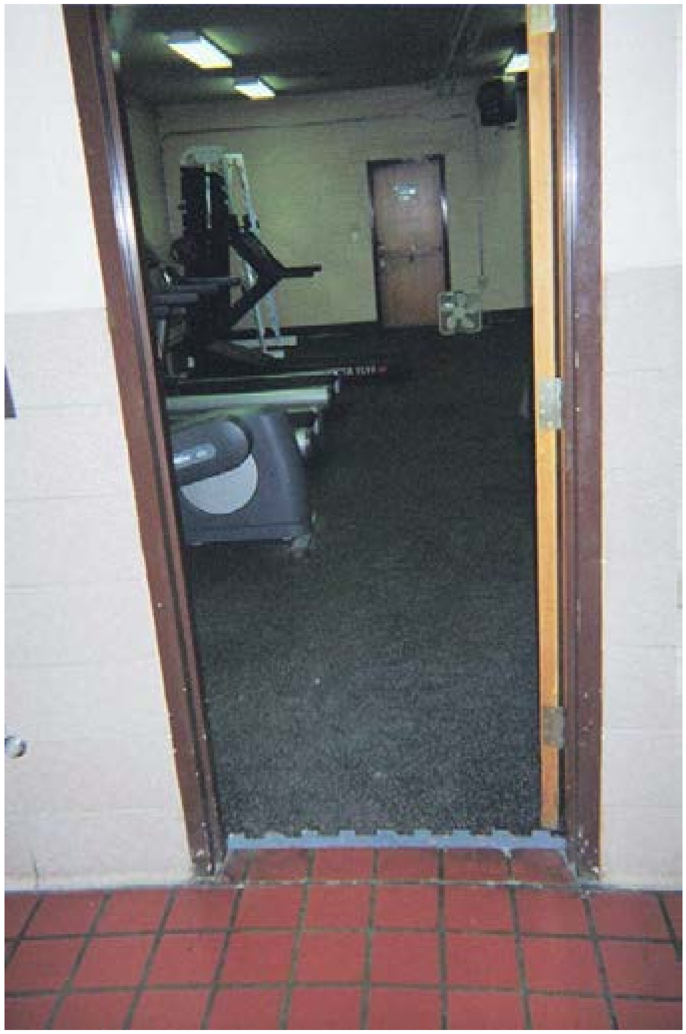
Photograph #3 – Drill Hall, wall-mounted ventilation exhaust

Photograph #4 – Women's Restroom, water-damaged ceiling plaster

Photograph #5 – Supply Room Office/Storage, material stacked in space

Photograph #6 – Men's Locker Room, non-functional exhaust (lead sample collected at vent)



Photograph #7 – Fitness Center, rubber mat over 12 x 12 tile

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Photography #8 – Fitness Center, natural ventilation via open windows

Photograph #9 – Kitchen, outdoor/make-up air duct/vent

Photograph #10 – Distance Learning Center office, portable “drainless” air-conditioner, (vent intake and exhaust to outdoors)

Photograph #11 – Computer Lab/Learning center

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Main Floor, Administrative Office, nine inch square floor tile

Photograph #12 – Basement, Unknown HVAC/ventilation duct

Basement, Recruiter's Office

BEST AVAILABLE COPY

Basement, Lounge, view of window-mounted air-conditioner

Main Floor, Old Signal Command Office, view of 9 inch square floor tile (presumed asbestos-containing)

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Basement, FMS Unit Office, nine inch square floor tile maintained in good condition.

Basement, Boiler Room, delaminating paint from valves

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Basement, Caretaker's Office/Storage (old coal room), storage conditions

Basement, FMS 9 Garage, view of vehicle exhaust vent system

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Basement, FMS 9, Flammable and Combustible storage cabinets

Basement, FMS 9 Office, written programs applicable to FMS 9

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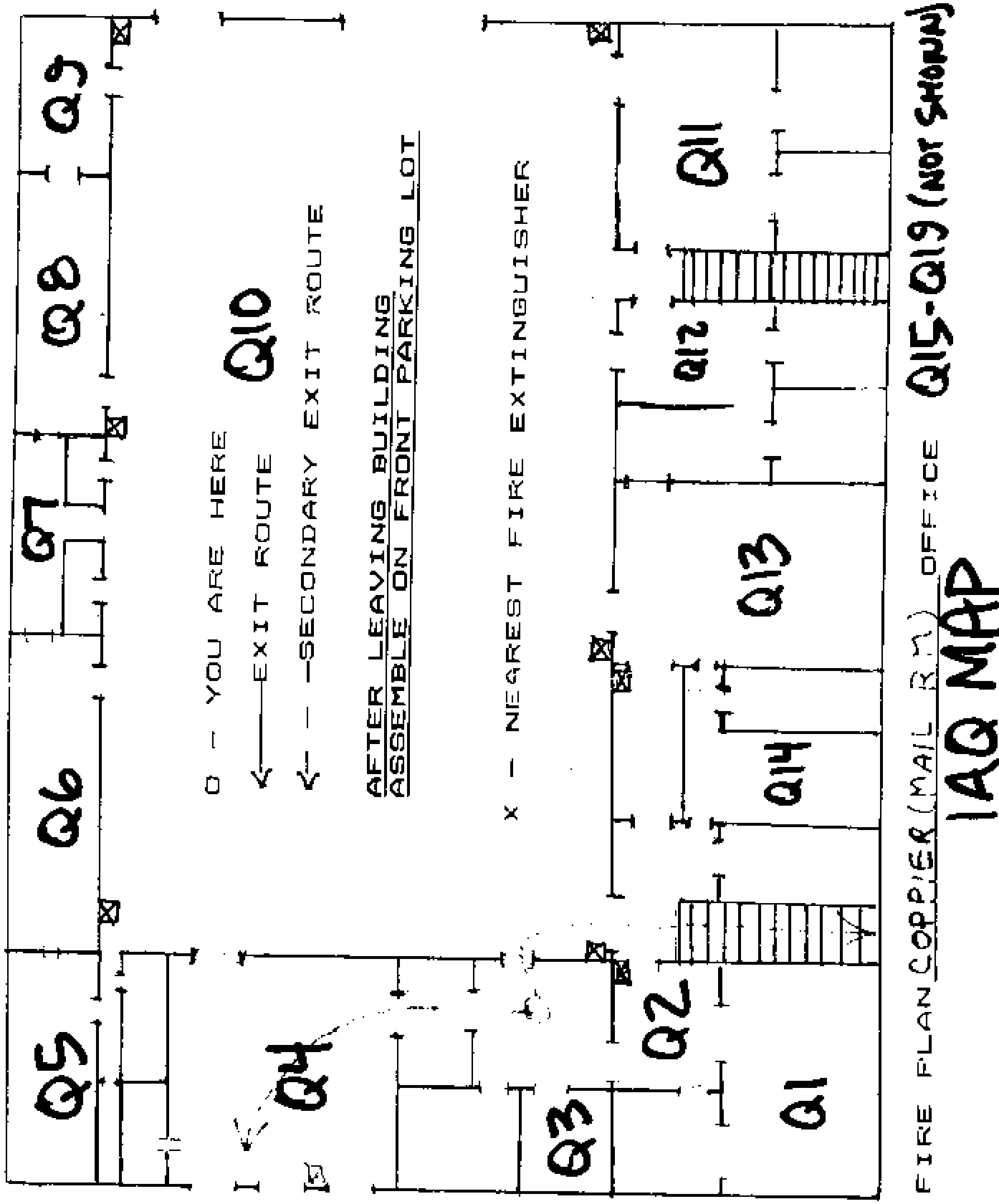
APPENDIX B

INDOOR AIR QUALITY MAP


IAQ MAP
FIRE PLAN COPPIER (MAIL RM) OFFICE
Q15-Q19 (NOT SHOWN)
O – YOU ARE HERE
←— EXIT ROUTE
← – – SECONDARY EXIT ROUTE
AFTER LEAVING BUILDING
ASSEMBLE ON FRONT PARKING LOT
X – NEAREST FIRE EXTINGUISHER
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
Q13
Q14

APPENDIX C

LABORATORY ANALYSIS RESULTS

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

100470
NY ELAP
10920

Client:	National Guard Bureau	**Job Name:**	National Guard Bureau	**Chain Of Custody:**	502993
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation Havre de Grace, Maryland 21078	**Job Location:**	Not Provided	**Date Submitted:**	7/28/2008
		Job Number:	EHS08794.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	8/1/2008

Report Date: 8/1/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0873108	CW-01	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873109	CW-02	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873110	CW-04	Flame	Paint Chip	****	N/A	0.01	%Pb		0.079	%Pb	
0873111	CW-05	Flame	Paint Chip	****	N/A	0.01	%Pb		0.02	%Pb	
0873112	CW-06	Flame	Wipe	****	0.108	111.52	ug/ft²		110	ug/ft²	
0873113	CW-07	Flame	Wipe	****	0.108	111.52	ug/ft²		480	ug/ft²	
0873114	CW-08	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873115	CW-09	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873116	CW-10	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873117	CW-11	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873118	CW-12	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873119	CW-13	Flame	Wipe	****	0.108	111.52	ug/ft²		530	ug/ft²	
0873120	CW-14	Flame	Wipe	****	0.108	111.52	ug/ft²		420	ug/ft²	
0873121	CW-15	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873122	CW-16	Flame	Wipe	****	0.108	111.52	ug/ft²		160	ug/ft²	
0873123	CW-17	Flame	Wipe	****	0.108	111.52	ug/ft²		210	ug/ft²	
0873124	CW-18	Flame	Wipe	****	0.108	111.52	ug/ft²		420	ug/ft²	
0873125	CW-19	Flame	Wipe	****	0.108	111.52	ug/ft²		140	ug/ft²	
0873126	CW-20	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCREDITED LABORATORY AIHA Environmental Lead See aihaqap.org for details

100470

NY ELAP

10920

Client:	National Guard Bureau	**Job Name:**	National Guard Bureau	**Chain Of Custody:**	502993		
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	7/28/2008		
	Havre de Grace, Maryland 21078	**Job Number:**	EHS08794.02	**Person Submitting:**	[redacted]		
		P.O. Number:	Not Provided	**Date Analyzed:**	8/1/2008	**Report Date:**	8/1/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments
0873127	CW-21	Flame	Wipe	****	0.108	111.52 ug/ft²	280 ug/ft²	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)

%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these sampes.

NY ELAP accrediation applies only to paint chip, wipe, and water samples.

Analyst: Melissa Sampson

Technical Manager: G Edward Carney

AMA Analytical Services, Inc.
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www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquiries) **502993**

BILL THE NATIONAL GUARD BUREAU REGION NORTH III OFFICE DIRECTLY. 1/2

Mailing/Billing Information:
1. Client Name: IES ENGINEERS
2. Address 1: 1720 WALTON RD
3. Address 2: BLUE BELL PA 19422
4. Address 3: ______
5. Phone #: ______ Fax #: ______

Submittal Information:
1. Job Name: NATL GUARD BUREAU
2. Job Location: ______
3. Job #: EHS 08794.02. P.O. #:
4. Contact Pers[redacted] Phone # 610 828-3078
5. Submitted by

Reporting Information (Results will be provided [redacted]

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ______	☐ Immediate ☐ 3 Day	☐ Include COC/Field Data Sheets with Report
☐ 24 Hours Time Due: ______	☐ Next Day ☒ 5 Day • Date Due: 9/4/08	☐ Email: ______ @ ______
Comments: ______	☐ 2 Day ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☐ Fax: ______
		☐ Verbals: ______

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
☐ NIOSH 7400 ______ (QTY)
☐ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
☐ AHERA ______ (QTY)
☐ NIOSH 7402 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
PLM Bulk
☑ EPA 600 – Visual Estimate CW-22 (QTY)
☑ EPA Point Count CW-22 (QTY)
☐ NY State Friable 198.1 ______ (QTY)
☐ Grav. Reduction ELAP 198.6 ______ (QTY)
☐ Other (specify ______) ______ (QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ______ (QTY)
☐ NY State PLM/TEM ______ (QTY)
☐ Residual Ash ______ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
☐ Quan. (s/area)Dust D6480-99 ______ (QTY)
TEM Water
☐ Qual. (pres/abs) ______ (QTY)
☐ ELAP 198.2/EPA 100.2 ______ (QTY)
☐ EPA 100.1 ______ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ______ °C)

Lead Analysis CW-04, CW-05
☑ Paint Chip ______ (QTY)
☑ Dust Wipe (wipe type ______) ______ (QTY)
☐ Air ______ (QTY)
☐ Soil/Solid ______ (QTY)
☐ TCLP ______ (QTY)
☐ Drinking Water ______ (QTY)
☐ Waste Water ______ (QTY)
☐ Dust Wipe (surface (wipe type ______) ______ (QTY)

Mold – Direct Microscopic Analysis
☐ Spore Trap ______ (QTY) ☐ Bulk ______ (QTY)
☐ Surface Swab ______ (QTY) ☐ Surface Vacuum Dust ______ (QTY)
☐ Surface Tape ______ (QTY) ☐ Other (Specify ______) ______ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
CW-01	COBD LK TL	7/24/08	–	100cm²				✓								
CW-02	BASE LVG HS							✓								
~~CW-03~~																
CW-04	BR Floor			BULK				✓			✓					
CW-05	BR Valve			BULK				✓			✓					
CW-06	K ORT							✓								
CW-07	K Heater							✓								
CW-08	K MAV							✓								
CW-09	DR Break Area							✓								
CW-10	PSO HSC							✓								
CW-11	DLO HSC							✓								

TAD

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 8/1/20 08 @ 1030 Via: FedEx By (Print): M. Sampson Sign: [signature]
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ____ / ____ / ____ Time: ______ Initials: ______
4. Comments: ______

LAB CONTACT: ERIN K. MEARA/AMA ANALYTICAL SERVICES, INC.

AMA Analytical Services, Inc.
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquiries) S02993 2/2

BILL THE NATIONAL GUARD BUREAU REGION NORTH IH OFFICE DIRECTLY.

Mailing/Billing Information:
1. Client Name: IES ENGINEERS
2. Address 1: 1720 WALTON RD
3. Address 2: BLUE BELL PA 19422
4. Address 3: ____
5. Phone #: ____ Fax #: ____

Submittal Information:
1. Job Name: NATL GUARD BUREAU
2. Job Location: CUMBERLAND ARMORY
3. Job #: EHS 08794.07 P.O. #
4. Contact Pers[redacted] @ phone # 610 828-3078
5. Submitted by[redacted]

Reporting Information (Results will be provided as soon as technically feasible): [redacted]

AFTER HOURS (must be prescheduled)
☐ Immediate Date Due: ____
☐ 24 Hours Time Due: ____
Comments: ____

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☐ 5 Day
☐ 2 Day Date Due: ____
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☐ Include COC/Field Data Sheets with Report
☐ Email: ____ @ ____
☐ Fax: ____
☐ Verbals: ____

Asbestos Analysis
PCM Air Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ NIOSH 7400____(QTY)
☐ Fiberglass ____(QTY)
TEM Air - Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ AHERA ____(QTY)
☐ NIOSH 7402 ____(QTY)
☐ Other (specify____) ____(QTY)
PLM Bulk
☑ EPA 600 – Visual Estimate____(QTY)
☑ EPA Point Count____(QTY)
☐ NY State Friable 198.1____(QTY)
☐ Grav. Reduction ELAP 198.6____(QTY)
☐ Other (specify____) ____(QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield____(QTY)
☐ NY State PLM/TEM____(QTY)
☐ Residual Ash____(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust____(QTY)
☐ Quan. (s/area) Vacuum D5755-95____(QTY)
☐ Quan. (s/area)Dust D6480 99____(QTY)
TEM Water
☐ Qual. (pres/abs)____(QTY)
☐ ELAP 198.2/EPA 100.2____(QTY)
☐ EPA 100.1____(QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____°C)

Lead Analysis
☐ Paint Chip____(QTY)
☑ Dust Wipe wipe type: G.W. Exp. Ghost Wipe (QTY) 100cm²
☐ Air____(QTY)
☐ Soil/Solid____(QTY)
☐ TCLP____(QTY)
☐ Drinking Water____(QTY)
☐ Waste Water____(QTY)
☑ Dust Wipe (surface type: ____) ____(QTY)

Mold - Direct Microscopic Analysis
☐ Spore Trap____(QTY) ☐ Bulk____(QTY)
☐ Surface Swab____(QTY) ☐ Surface Vacuum Dust____(QTY)
☐ Surface Tape____(QTY) ☐ Other (Specify____) ____(QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE	TAPE	SWAB
CW-12	CL HSC	7/24/09	—	100cm²				✓								
CW-13	AO HSC							✓								
CW-14	LIBRARY HSC							✓								
CW-15	NE STAIR HSC							✓								
CW-16	Womens RR TD							✓								
CW-17	Supply Store HSC							✓								
CW-18	Men's Locker EY							✓								
CW-19	FC EC/H HSC							✓								
CW-20	Maint Unit HSC							✓								
CW-21	FM9 Stair HSC							✓								
CW-22	Women's RR EP			BULK ASBESTOS			✓				✓					

CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: ____ Contact: ____ By: ____
Date/Time: ____ Contact: ____ By: ____
Date/Time: ____ Contact: ____ By: ____

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: __/__/__ @____ Via: ____ By (Print): ____ Sign: ____
2. Date/Time Analyzed: __/__/__ @____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: __/__/__ Time: ____ Initials: ____
4. Comments: ____

LAB CONTACT: ERIN K. MEARA / AMA ANALYTICAL SERVICES, INC.

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

Client:	National Guard Bureau	**Job Name:**	National Guard Bureau	**Chain Of Custody:**	502993
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Analyzed:**	8/1/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EHS08794.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided		
Attention:	[redacted]				

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Color	Homogeneity	Analyst ID	Comments
0873128	CW-22	NAD	--	--	--	--	--	--	--	--	--	100	White	Homogeneous	LBP	

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

NAD = "No Asbestos Detected"   TR = "Trace equals less than 1% of this component"

Uncertainty: For samples containing asbestos in range of 1-10% the CV is 0.43, 11-35% CV=0.55, >35 CV=0.23

Lom Butruk

Lom Butruk

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AMA Analytical Services, Inc.
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
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www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **502993**

BILL THE NATIONAL GUARD BUREAU REGION NORTH IH OFFICE DIRECTLY. 1/2

Mailing/Billing Information:
1. Client Name: IES ENGINEERS
2. Address 1: 1720 WALTON RD
3. Address 2: BLUE BELL PA 19422
4. Address 3:
5. Phone #: Fax #:

Submittal Information:
1. Job Name: NATL GUARD BUREAU
2. Job Location:
3. Job #: EHS 08794.07 [redacted] P.O. #
4. Contact Perso[redacted] @ phone # 610 828-3078
5. Submitted by: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day + Date Due: 8/4/08
☐ 2 Day
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

☐ Include COC/Field Data Sheets with Report
☐ Email: @
☐ Fax:
☐ Verbal:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
☐ NIOSH 7400 ___ (QTY)
☐ Fiberglass ___ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
☐ AHERA ___ (QTY)
☐ NIOSH 7402 ___ (QTY)
☐ Other (specify ___) ___ (QTY)
PLM Bulk
☑ EPA 600 – Visual Estimate CW-22 (QTY)
☑ EPA Point Count CW-22 (QTY)
☐ NY State Friable 198.1 ___ (QTY)
☐ Grav. Reduction ELAP 198.6 ___ (QTY)
☐ Other (specify ___) ___ (QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ___ (QTY)
☐ NY State PLM/TEM ___ (QTY)
☐ Residual Ash ___ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ___ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ___ (QTY)
☐ Quan. (s/area) Dust D6480-99 ___ (QTY)
TEM Water
☐ Qual. (pres/abs) ___ (QTY)
☐ ELAP 198.2/EPA 100.2 ___ (QTY)
☐ EPA 100.1 ___ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ___ °C)

Lead Analysis CW-04, CW-05
☑ Paint Chip ___ (QTY)
☑ Dust Wipe (wipe type ___) ___ (QTY)
☐ Air ___ (QTY)
☐ Soil/Solid ___ (QTY)
☐ TCLP ___ (QTY)
☐ Drinking Water ___ (QTY)
☐ Waste Water ___ (QTY)
☐ Dust Wipe Furnace (wipe type ___) ___ (QTY)

Mold - Direct Microscopic Analysis
☐ Spore-Trap ___ (QTY) ☐ Bulk ___ (QTY)
☐ Surface Swab ___ (QTY) ☐ Surface Vacuum Dust ___ (QTY)
☐ Surface Tape ___ (QTY) ☐ Other (Specify ___) ___ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
CW-01	CORD LR TL	7/28/08	–	100cm²				✓								
CW-02	BASE LVG HS							✓								
~~CW-03~~																
CW-04	BR Floor			BULK				✓			✓					
CW-05	BR Valve			BULK				✓			✓					
CW-06	K ORT							✓								
CW-07	K Heater							✓								
CW-08	K MAV							✓								
CW-09	DR Break Area							✓								
CW-10	PSO HSC							✓								
CW-11	DLO HSC							✓								

TBD

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 8/1/08 09 @ 1030 Via: FedEx By (Print): M. Sampson Sign:
2. Date/Time Analyzed: 8/4/08 @ 16:20 By (Print): LOM BUTRUK Sign: Lom Butruk
3. Results Reported To: T. H. Derr Via: Date: 8/4/08 Time: Initials: LRP
4. Comments:

LAB CONTACT: ERIN K. MEARA/AMA ANALYTICAL SERVICES, INC.

BEST AVAILABLE COPY

AMA Analytical Services, Inc.
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 502993 2/2

BILL THE NATIONAL GUARD BUREAU REGION NORTH IH OFFICE DIRECTLY.

Mailing/Billing Information:
1. Client Name: IES ENGINEERS
2. Address 1: 1720 WALTON RD
3. Address 2: BLUE BELL PA 19422
4. Address 3: ____
5. Phone #: ____ Fax #: ____

Submittal Information:
1. Job Name: NAT'L GUARD BUREAU
2. Job Location: CUMBERLAND ARMORY
3. Job #: EHS 08794.02 P.O. #: ____
4. Contact Perso[redacted] @ phone # 610 828-3078
5. Submitted by: [redacted]

Reporting Information (Results will be provided as soon as technically feasible): [redacted]

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ Immediate Date Due: ____ ❑ 24 Hours Time Due: ____ Comments: ____	❑ Immediate ❑ 3 Day ❑ Results Required By Noon ❑ Next Day ❑ 5 Day + (Every Attempt Will Be ❑ 2 Day Date Due: ____ Made to Accomodate)	❑ Include COC/Field Data Sheets with Report ❑ Email: ____ @ ____ ❑ Fax: ____ ❑ Verbals: ____

Asbestos Analysis
PCM Air - Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
❑ NIOSH 7400____(QTY)
❑ Fiberglass ____(QTY)
TEM Air - Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
❑ AHERA ____(QTY)
❑ NIOSH 7402 ____(QTY)
❑ Other (specify____)____(QTY)
PLM Bulk
☑ EPA 600 – Visual Estimate____(QTY)
☑ EPA Point Count ____(QTY)
❑ NY State Friable 198.1 ____(QTY)
❑ Grav. Reduction ELAP 198.6____(QTY)
❑ Other (specify____)____(QTY)

TEM Bulk
❑ ELAP 198.4/Chatfield ____(QTY)
❑ NY State PLM/TEM ____(QTY)
❑ Residual Ash ____(QTY)
TEM Dust
❑ Qual. (pres/abs) Vacuum/Dust____(QTY)
❑ Quan. (s/area) Vacuum D5755-95 ____(QTY)
❑ Quan. (s/area)Dust D6480-99____(QTY)
TEM Water
❑ Qual. (pres/abs)____(QTY)
❑ ELAP 198.2/EPA 100.2 ____(QTY)
❑ EPA 100.1 ____(QTY)

❑ All samples received in good condition unless otherwise noted. (TEM Water samples ____°C)

Lead Analysis
❑ Paint Chip____(QTY)
☑ Dust Wipe (wipe type ENV. Exp. Ghost Wipe)(QTY) 100cm²
❑ Air____(QTY)
❑ Soil/Solid____(QTY)
❑ TCLP____(QTY)
❑ Drinking Water____(QTY)
❑ Waste Water____(QTY)
☑ Dust Wipe Furnace (wipe type____)____(QTY)

Mold - Direct Microscopic Analysis
❑ Spore-Trap ____(QTY) ❑ Bulk ____(QTY)
❑ Surface Swab ____(QTY) ❑ Surface Vacuum Dust ____(QTY)
❑ Surface Tape____(QTY) ❑ Other (Specify____)____(QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
CW-12	CL HSC	7/01/08	—	100cm²				✓									Date/Time: Contact: By:
CW-13	AO HSC							✓									
CW-14	Library HSC							✓									
CW-15	NE STAIR HSC							✓									
CW-16	Women's RR TD							✓									Date/Time: Contact: By:
CW-17	Supply Store HSC							✓									
CW-18	Men's Locker EY							✓									
CW-19	FC EC/H HSC							✓									
CW-20	Maint Unit HSC							✓									Date/Time: Contact: By:
CW-21	FM9 Std/ HSC							✓									
CW-22	Women's RR CP			BULK ASBESTOS			✓				✓						

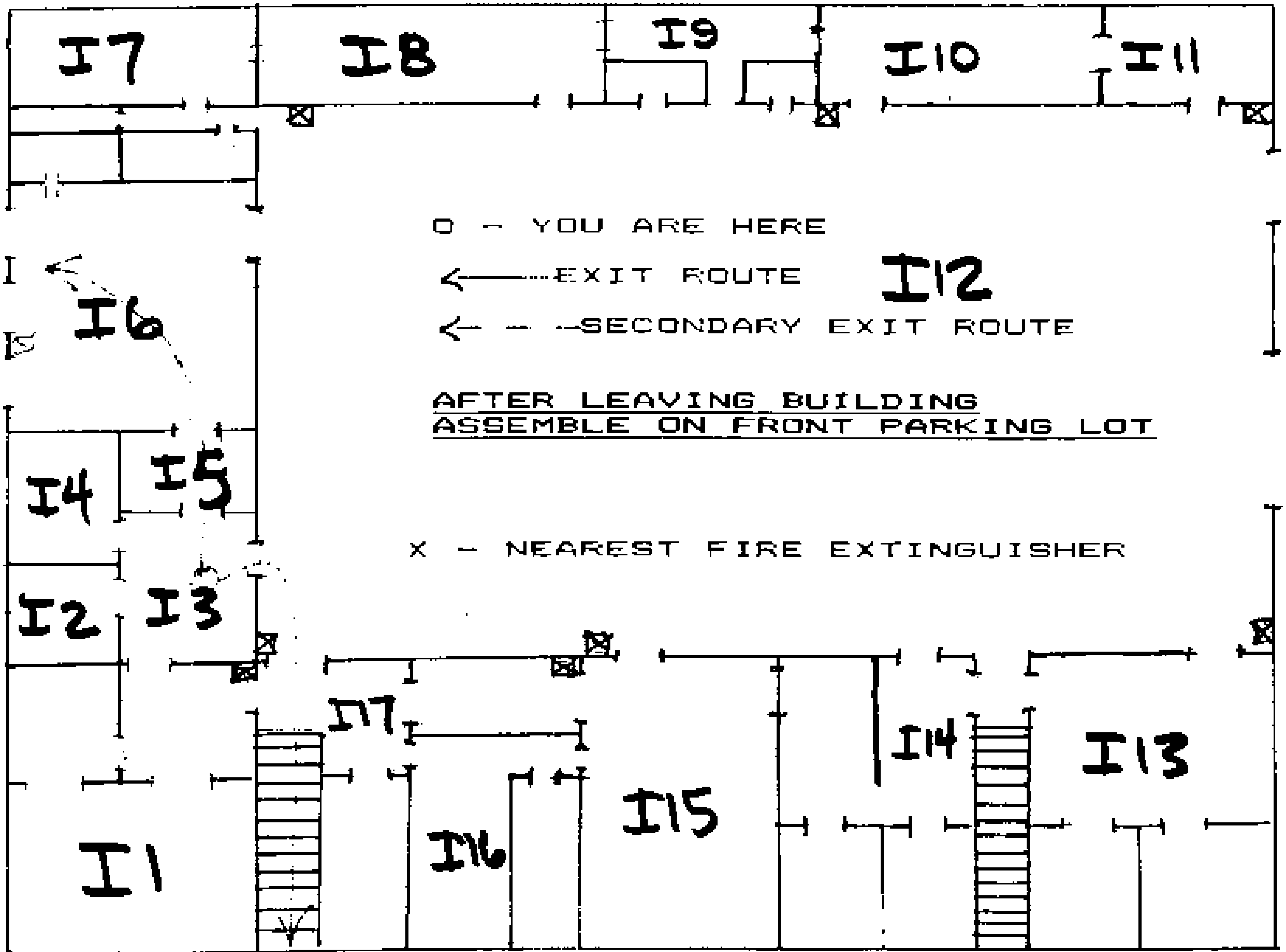
LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: ____/____/____ @____ Via:____ By (Print) ____ Sign: ____
2. Date/Time Analyzed: ____/____/____ @____ By (Print) ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ____/____/____ Time: ____ Initials: ____
4. Comments ____

LAB CONTACT: ERIN K. MEARA/AMA ANALYTICAL SERVICES, INC.

IES ENGINEERS

APPENDIX D

ILLUMINANCE READINGS MAP



FIRE PLAN COPPIER (MAIL ...) OFFICE

I18-I21 (NOT SHOWN)

ILLUMINANCE SURVEY MAP

National Guard Region North

National Guard Readiness Center
Industrial Hygiene Evaluation
Cumberland Army National Guard Armory
Cumberland, MD 21502-3499

Prepared for:

National Guard Region North
Industrial Hygiene Office
301 Old Bay Lane
Havre De Grace, MD 21078

Attn: [redacted]

Prepared by:

Bonus Environmental, LLC
P.O. Box 121
Mt. Pleasant, Michigan 48804

Project No. 1061-03
August 4, 2010

Bonus Environmental, LLC

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APPENDICES

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Appendix B *Lead Sample Results*

Appendix C *Photographs*

Appendix D *References*

August 4, 2010
Project No. 1061-03

National Guard Region North
Industrial Hygiene Office
301 Old Bay Lane
Havre De Grace, MD 21078-4003

Attn: [redacted]

Project: Army National Guard Readiness Center, Industrial Hygiene Evaluation
Cumberland Army National Guard Armory

1.0 - EXECUTIVE SUMMARY

Bonus Environmental, LLC was contracted by the National Guard Bureau Region North to identify and measure the existence and extent of potentially hazardous operations or conditions at the Cumberland Army National Guard Readiness Center located at 1100 Brown Avenue in Cumberland, Maryland. The purpose of this evaluation was to generate or to update a previous baseline evaluation so that employee exposure history can be provided to each civilian and military employee. The following industrial hygiene and safety programs were evaluated during this industrial hygiene evaluation performed by Bonus Environmental, LLC representative [redacted] on May 18, 2010:

- Indoor Air Quality
- Use of items on the Hazardous Materials List
- Vehicle maintenance activities
- Lead Wipe & Air Sampling
- Illumination
- Ergonomics
- Evaluation of the physical condition of the facility in regards to peeling paint, asbestos containing materials, water damage or mold problems, and housekeeping practices.

The Cumberland Readiness Center is an Army National Guard armory comprised of offices, a drill hall, kitchens, a former indoor firing range, an attached maintenance garage, a fitness room, supply rooms, a boiler room, a battery room, a locker room, a classroom and a lunch room. The point of contact for this facility was SFC [redacted]. Five (5) full-time administrative personnel and four (4) full-time maintenance personnel are employed in the approximately 25,922 ft² facility. A shop diagram depicting the locations of the operations identified during this industrial hygiene evaluation is attached to this report as Appendix A.

The National Guard Bureau Region North Industrial Hygiene Office provided governmental furnished equipment and sampling media required to perform the industrial hygiene evaluation. Chain of custody forms for laboratories approved by the National Guard Bureau Region North Industrial Hygiene Office were provided with the sampling media. All samples collected during this industrial hygiene evaluation were sent to the National Guard Bureau Region North Industrial Hygiene Office approved laboratories for analysis.

2.0 – LEAD SAMPLING

2.1 – Lead Wipe Sampling

Lead wipe sampling was performed according to the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame). Twenty one (21) wipe samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. The National Guard Bureau Region North Industrial Hygiene Office has established/interpreted a threshold of 200 µg/ft² of lead concentration for surface cleanliness. The following table outlines the locations and analytical results for the lead wipe samples collected during this project

Army National Guard - Cumberland Readiness Center
Lead Wipe Sample Results

Sample #	Sample Date	Sample Location	Sample Area (ft^2)	Sample Result ($\mu g/ft^2$)
CL-W-1	5-18-10	Field Blank	---	< 12
CL-W-2	5-18-10	Drill hall, NW corner, top of microwave	0.111	< 110
CL-W-3	5-18-10	Drill hall, along west wall, top of trophy case	0.111	< 110
CL-W-4	5-18-10	Drill hall, along east wall, top of "Amnesty box"	0.111	< 110
CL-W-5	5-18-10	Drill hall, floor, south end "free throw" line	0.111	< 110
CL-W-6	5-18-10	Drill hall, floor, north end "free throw" line	0.111	< 110
CL-W-7	5-18-10	Kitchen (NW corner of Drill hall), along south wall, top of file cabinet	0.111	< 110
CL-W-8	5-18-10	Locker room (former indoor firing range), NE corner, light fixture	0.111	140
CL-W-9	5-18-10	Locker room (former indoor firing range), SE corner, surface of overhead heater	0.111	< 110
CL-W-10	5-18-10	Locker room (former indoor firing range), SW corner, top of locker #53	0.111	< 110
CL-W-11	5-18-10	Locker room (former indoor firing range), center of room, floor	0.111	< 110
CL-W-12	5-18-10	Outside of NE entrance to locker room, on handrail to ground floor	0.111	< 110
CL-W-13	5-18-10	Fitness room, NE corner, top of stereo	0.111	< 110
CL-W-14	5-18-10	Supply room #2, center of room, top of file cabinet	0.111	< 110
CL-W-15	5-18-10	Lobby, ledge along north wall	0.111	< 110
CL-W-16	5-18-10	Office #8/9, NW corner, table top surface	0.111	< 110
CL-W-17	5-18-10	DLC classroom, north side, surface of eastern-most desk	0.111	< 110

Army National Guard - Cumberland Readiness Center Lead Wipe Sample Results				
Sample #	***Sample Date***	***Sample Location***	***Sample Area (ft^2)***	***Sample Result ($\mu g/ft^2$)***
CL-W-18	5-18-10	Lunch room, on bar countertop surface	0.111	< 110
CL-W-19	5-18-10	FMS maintenance office room #19, along north wall, top of shelf	0.111	< 110
CL-W-20	5-18-10	Boiler room, SW corner, top of compressor	0.111	< 110
CL-W-21	5-18-10	Maintenance garage, south side of bay #2, top of parts drawer	0.111	< 110
CL-W-22	5-18-10	Maintenance garage, battery room, surface of center storage shelf	0.111	1,800

Surface cleanliness threshold = < 200 $\mu g/ft^2$

2.2 – Lead Air Sampling

The purpose of lead air monitoring was to document task-specific activities and corresponding exposures to lead. Occupational Safety and Health Administration (OSHA) 29 CFR 1926.62 requires employers whose employees are exposed to lead in the work place, in any quantity, make a determination whether any employee's exposure exceeds the action level (AL) of 30 $\mu g/m^3$ or the maximum permissible exposure limit (PEL) of 50 $\mu g/m^3$ as 8-hour time weighted averages (TWAs). If employee exposures are less than 30 $\mu g/m^3$, training is required under the Hazard Communication 29 CFR 1926.59. Exposures that exceed the AL or PEL require the employer to comply with additional requirements, including air monitoring, additional training, and restricted work practices as outlined in OSHA 29 CFR 1926.62.

Representative fixed area sampling was conducted for potential airborne concentrations of lead in accordance with accepted Industrial Hygiene methods recognized by the National Institute for Occupational Safety and Health (NIOSH) and OSHA. Representative breathing zone samples were not collected from an employee performing administrative tasks.

Lead exposure monitoring was performed in accordance with the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame) with SKC personal air sampling pumps calibrated to 2.0 liters per minute. All samples were collected on 37 mm diameter cassettes with mixed-cellulose ester filters. All sampling pumps were calibrated before and after each use to ensure volume accuracy. Two (2) samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. Analytical results of the lead wipe and air samples are attached to this report as Appendix B.

Army National Guard - Cumberland Readiness Center
Lead Air Sample Results

Sample #	Sample Type	Sample Location	Flow Rate	Start	Stop	Vol.	Reprt. Limit (µg/m³)	Results (µg/m³)	8 hr TWA (µg/m³)
May 18, 2010									
CL-A-1	FB	Field Blank	---	---	---	0	3	< 3	N/A
CL-A-2	IWA	Room #6, SFC [redacted] office desk, during daily activities	2.0	0743	1523	920	3.3	< 3.3	N/A
CL-A-3	IWA	Maintenance garage, between bays 1 & 2	2.0	0746	1526	920	3.3	< 3.3	N/A

PS = Personal sample, **IWA** = Inside work area, **N/A** = Not Applicable
Note: The OSHA PEL of 50 µg/m³ is averaged over an 8 hr work shift

3.0 - PHYSICAL CONDITION OF FACILITY / PERSONNEL CONCERNS

3.1 - Lead Based Paint

During the industrial hygiene evaluation of the Army National Guard Cumberland Readiness Center, Bonus Environmental, LLC performed a visual inspection of the facility in regards to lead based paint. Bonus Environmental, LLC identified one area of peeling paint which could potentially pose a lead exposure hazard. This area was the west wall of the boiler room. A bulk sample paint chip was collected from the west wall of the boiler room. The paint chip sample was sent under chain-of-custody procedures to AMA Analytical Services, Inc. located in Lanham, Maryland for analysis. Sample analysis has indicated that the paint chip sample contained detectable levels of lead. The paint is therefore considered to be lead based paint and all activities that involve lead based paints are regulated by OSHA Lead in Construction Standard, 29 CFR 1926.62. The OSHA Lead in Construction Standard does not assign a numerical value of which must be present within the paint to be considered lead based paint. Paints which contain any detectable level of lead shall be treated and handled as lead based paint. HUD defines lead based paint as having greater than 0.5% lead by weight. The paint chip sample collected during this industrial hygiene evaluation did not contain lead in excess of 0.5% by weight. Analytical results are attached to this report as Appendix B.

LeadCheck™, ChromateCheck™, NickelCheck™, and CadmiumCheck™ swabs were utilized as a screening method on the floor of Maintenance bay #1, where welding activities have occurred in the past. Metal-specific swabs were used to test for the presence of cadmium, chromate, lead, and nickel. All swabs gave a negative indication for the given metal contaminant.

3.2 – Presumed Asbestos Containing Materials

During the industrial hygiene evaluation of the Army National Guard Cumberland Readiness Center, Bonus Environmental, LLC performed a visual inspection to identify presumed asbestos containing materials (PACM) and, if found, to note their condition. Bonus Environmental, LLC did not identify any PACM that was considered to be in poor or damaged condition.

3.3 - Water Damage/Mold Growth

During the industrial hygiene evaluation of the Army National Guard Cumberland Readiness Center, Bonus Environmental, LLC performed a visual inspection to report the location and perform an evaluation of any water damaged or visible mold problems. Bonus Environmental, LLC identified no water-damaged and/or moldy building materials during the survey.

3.4 - Housekeeping

During the industrial hygiene evaluation of the Army National Guard Cumberland Readiness Center, Bonus Environmental, LLC performed an evaluation of the housekeeping practices. Bonus Environmental, LLC found the housekeeping to be in good order.

3.5 – Employee Interviews

During the industrial hygiene evaluation of the Army National Guard Cumberland Readiness Center, Bonus Environmental, LLC performed interviews and made observations to determine if the work activities being performed possessed any ergonomic concerns. Following the interviews and observations, no ergonomic and or indoor air quality concerns were identified.

3.6 – Indoor Air Quality

During the industrial hygiene evaluation of the Army National Guard Cumberland Readiness Center, Bonus Environmental, LLC measured temperature, relative humidity, carbon monoxide (CO), and carbon dioxide (CO_2) throughout the facility. A calibrated TSI Q-Trak Model 7565 Indoor Air Quality Monitor equipped with a Q-Trak Probe 982 was utilized to record indoor air quality measurements.

Carbon dioxide is a natural component of air and the amount of CO_2 in a given air sample is commonly expressed as parts per million (ppm). The outdoor air in most locations contains about 380 ppm carbon dioxide. Higher outdoor CO_2 concentrations can be found near vehicle traffic areas, industry and sources of combustion. The concentrations of CO_2 found in most offices are well below the OSHA Permissible Exposure Limit (PEL) of 5,000 ppm when averaged over an 8-hour time period for an industrial workplace. While levels below 5,000 ppm are considered to pose no serious health threat, studies have indicated that individuals in offices with elevated CO_2 concentrations tend to report drowsiness, lethargy and a general sense that the air is stale. Ventilation rates for office spaces are defined by various codes and standards. The most widely accepted standard is the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 62. According to ASHRAE Standard 62.1-2007, CO_2 concentrations below 700 ppm above the outdoor level are considered to indicate adequate ventilation and provide human comfort. The CO_2 measurements collected during this industrial hygiene evaluation ranged from 438 ppm to 543 ppm and indicate adequate ventilation within the facility.

Carbon monoxide, also known as the "silent killer," is a colorless, odorless, poisonous gas that results from the incomplete burning of common fuels such as natural or liquefied petroleum gas, oil, wood or coal. When carbon monoxide is inhaled, it enters the blood stream and reduces the ability of the blood to carry oxygen to vital organs, such as the heart and brain. Because it is impossible to see, taste or smell the toxic fumes, CO can harm you before you are aware it is in your work area. At lower levels of exposure, CO causes mild effects that are often mistaken for the flu. These symptoms include headaches, dizziness, disorientation, nausea and fatigue. The effects of CO exposure can vary greatly from person to person depending on age, overall health and the concentration and length of exposure. The OSHA has established a PEL of 50 ppm. OSHA standards prohibit worker exposure to more than 50 parts of the gas per million parts of air averaged during an 8-hour time period. The peak CO level for employees is 200 ppm. The CO measurements collected during this industrial hygiene evaluation ranged from 0.5 ppm to 1.2 ppm. CO levels were well below the OSHA PEL during this industrial hygiene evaluation.

During the industrial hygiene evaluation of the Army National Guard Cumberland Readiness Center, Bonus Environmental, LLC collected temperature measurements. Temperature measurements throughout the facility ranged from 64.8ºF to 71.6ºF and are considered to be within an acceptable range.

During the industrial hygiene evaluation of the Army National Guard Cumberland Readiness Center, Bonus Environmental, LLC collected relative humidity measurements. Relative humidity measurements throughout the facility ranged from 45.3% to 47.8% and are considered to be within an acceptable range. Indoor air quality measurements recorded during this industrial hygiene evaluation are summarized in the table below.

Army National Guard - Cumberland Readiness Center
Indoor Air Quality Measurements

Location	*CO_2 (ppm)*	*CO (ppm)*	*Relative Humidity (%)*	*Temperature (ºF)*
Outdoors, south side entrance	401	1.7	63.8	65.1
Drill hall, center of room	438	1.1	46.1	64.8
Fitness room #3	474	0.6	46.9	65.0
Supply room #2	472	0.9	47.4	65.5
Office room 8/9	509	1.0	47.8	66.4
VTEC room	511	0.5	47.7	70.7
Lunch room	505	1.0	46.7	70.0
FMS maintenance office room #19	543	1.1	46.2	71.1
Boiler room	476	1.2	45.7	71.6
Battery room	484	1.2	45.3	70.3
Maintenance garage, between bays 1 & 2	468	1.1	45.5	70.4

Required/Recommended Values
CO_2 *- OSHA PEL = 5,000 ppm and ASHRAE Standard 62.1-2007 = no greater than 700 ppm above outdoor*
CO *- OSHA PEL = 50 ppm and OSHA Ceiling Limit = 200 ppm*
Temperature *- ASHRAE Standard 55-2004 = between approximately 67 and 82 °F.*
RH *– ANSI/ASHRAE Standard 62.1-2007 = <65%*

4.0 – LIGHTING

Utilizing a properly calibrated Cooke Corporation cal-Light 400 light meter, Bonus Environmental, LLC collected illumination readings throughout the facility. Illumination measurements recorded during this industrial hygiene evaluation are summarized in the table below.

Army National Guard - Cumberland City Readiness Center Lighting Survey			
Location	*Measurement in Foot Candles*	*Requirement in Foot Candles*	*Requirement Met?*
Common area/Kitchen/Room 116	13.2	10	YES
Fitness room #3	5.2	30	NO
Men's latrine	25.5	5	YES
Supply room #2	36.4	30	YES
Supply room #1	11.9	30	NO
FAC Engineer office #4	36.0	50	NO
Common women's latrine	21.8	5	YES
Drill hall, center of room	26.5	30	NO
Front entrance lobby	11.7	5	YES
Room #6 – Office	61.6	50	YES
Retention NCO office	27.3	50	NO
Room #7 – Office	22.1	50	NO
Room #8/9 – Office	66.0	50	YES
Library	79.7	30	YES
Room #10 – Office	23.9	50	NO
Room #11 – Office	58.5	50	YES
Telecommunications Room (Internet access room)	8.6	30	NO
SR. staff men's latrine	36.6	5	YES
Copy room	21.7	30	NO
Common kitchen	16.6	10	YES
Training room #12	23.9	30	NO
Female restroom	22.1	5	YES
DLC classroom	32.2	30	YES
VTEC office	38.4	50	NO
Room #13 – Office	52.5	50	YES
Room #14 – Office	14.6	50	NO
Room #15 - Office	36.9	50	NO
Locker room #16	60.4	7	YES
Recruiter's office #17	21.5	50	NO
Common men's room	41.2	5	YES
Lunch room	22.4	10	YES
Common kitchen	3.2	10	NO
Hallway outside of lunch room	15.4	5	YES
Dispatch office #18	68.5	50	YES
FMS Maintenance Office #19	98.5	50	YES
Boiler room	32.0	30	YES
Caretaker's storage room	11.2	30	NO
Center of maintenance shop, bay #1	52.0	75	NO
OMS tool room #23	16.8	30	NO
OMS computer room #24	29.5	30	NO
Battery room #22	45.9	30	YES
Storage area above rooms 22 & 24	18.4	30	NO
Maintenance shop, between bays 2 & 3	20.6	75	NO
Storage vaults 1 & 2	Inaccessible		

Lighting levels were compared to the levels outlined within the ANSI/IESNA RP-1-04 Office Lighting Handbook, and the ANSI/IESI RP-7-01 Lighting Industrial Facilities Handbook. Areas within the facility which did not meet the foot candle requirements are identified with a "NO" within the Requirement Met? column. It is recommended that illumination be improved in all the areas that did not meet the requirements. Improving illumination can be achieved by replacing burned-out lamps/bulbs, cleaning fixtures, relocating detailed work activities to more illuminated areas, and using supplemental task lighting.

5.0 – EVALUATION OF ATTACHED GARAGE

5.1 – Operational Description - Readiness Center

Five administrative and four maintenance personnel are assigned to the Cumberland Readiness Center to provide space for units to support and train soldiers. Vehicle maintenance typically occurs during the normal work hours of Monday-Friday, 0630-1700. The attached garage includes four bays, three of which include vehicle exhaust ventilation. Personal protective equipment including leather gloves, nitrile gloves, ear plugs, and safety glasses are available to all employees who work within the attached garage. Activities conducted on the day of the industrial hygiene evaluation included engine and brake repairs.

5.2 – Local Exhaust Ventilation System

Exhaust ventilation systems were identified in the Cumberland Readiness Center facility during the industrial hygiene evaluation. The ventilation system consisted of a central exhaust fan and series of flexible trunks of ductwork. The central exhaust fan was centrally located and exhausted directly to the outdoors through the west wall. The exhaust ventilation system was installed for the purpose of removing diesel exhaust fumes. A TSI VelociCalc 9555 Multiparameter Ventilation Monitor was utilized to collect multiple measurements of the face velocity of each flexible trunk of ductwork. The table below details the results of the ventilation system evaluation in the Cumberland Readiness Center facility.

Army National Guard - Cumberland Readiness Center Vehicle Exhaust - Ventilation System Evaluation				
Location	*Measured Average Face Velocity (fpm)*	*Calculated Volumetric Flow (cfm)*	*Area of the Opening (ft²)*	*Sufficient Air Flow*
Bay #2 (south)	2,473	866	0.35	NO
Bay #3 (center)	1,164	407	0.35	NO
Bay #4 (north)	1,438	503	0.35	NO

cfm = cubic feet per minute, calculated by multiplying the measured face velocity by the area of the opening, **fpm** = feet per minute, **calculated reference value** = 1,385 acfm

Figure VS-85-02 on page 13-151 of the ACGIH "A Manual of Recommended Practice for Design, 26th Edition" specifies that tailpipe exhaust ventilation volumes for operating engines connected directly to a tailpipe exhaust system are to be determined by the engine displacement, the engine RPM, and tailpipe exhaust temperature, plus a 20% safety factor. The largest types of vehicles serviced within the Maintenance Shop are M917A2 20-ton dump trucks equipped with a Detroit Diesel 60 series 12.7 Liter diesel engine which operates at 1,800 RPM. Based on an average tailpipe temperature of 300ºF, the minimum required volume flow rate of the overhead exhaust system used to control emissions from the fumes of diesel exhaust was calculated to be 1,385 acfm (actual cubic feet per minute). The representative exhaust duct systems tested in the Cumberland Readiness Center facility did not provide sufficient air flow.

6.0 – BATTERY SHOP

Mechanics from the Maintenance Shop work within the Battery Shop on an as needed basis. The Battery room is used for storage and charging of batteries. Batteries in need of repair are shipped to another facility. Personal protective equipment including an apron, nitrile gloves, eye goggles, and face shield are available to all employees who work within the Battery Shop. No work activities were being performed within the Battery Shop during the industrial hygiene evaluation.

Lead acid batteries produce hydrogen gas and other fumes at 80% recharge point, making proper ventilation in the battery charging area extremely important. Hydrogen gas is not only colorless and odorless, but is lighter than air, causing the gas to rise to the top of a building. For safety purposes, the concentration of hydrogen in the air should be kept below 1% to reduce risk of explosion. An evaluation of the ventilation system within the Battery Shop was performed during this industrial hygiene evaluation of the facility. The Battery Shop is used as a place of storage and charging of lead-acid batteries. Forty (40) 8-cell (1,225 cranking amps capacity) batteries were located in the battery room, with twenty three (23) of them on chargers. A wall-mounted rectangular exhaust fan measuring 22"x 8" located along the west wall provides ventilation to the room. A TSI VelociCalc 9555 Multiparameter Ventilation Monitor was utilized to measure the face velocity at the exhaust fan. Measurements indicated that the exhaust fan provides an average volumetric flow rate of 583 fpm. The entry door to the Battery Shop is kept open to provide make-up air. The ventilation rate of the exhaust system required during the charging of twenty three (23) 8-cell batteries within the Battery Shop was calculated with the following formula.

Q = 0.054 x I x N where,

- Q = required ventilation rate, cfm
- I = 0.21 x (capacity of largest battery to be charged in amp-hours) or 0.25 x (maximum obtainable amps from charger), whichever is greater
- N = number of batteries to be charged at one time x number of cells per battery

In this case, the required ventilation of the exhaust system (Q) within the Battery Shop was determined to be 250 cfm, where I=0.21 x 120 Ah, N=23 x 8. The ventilation rate of the exhaust system in place within the Battery Shop was determined to be 711 cfm.

7.0 - CONCLUSION

Bonus Environmental, LLC was contracted by the National Guard Bureau Region North to identify and measure the existence and extent of potentially hazardous operations or conditions at the Cumberland Army National Guard Readiness Center located at 1100 Brown Avenue in Cumberland, Maryland. The purpose of this evaluation was to generate or to update a previous baseline evaluation so that employee exposure history can be provided to each civilian and military employee. An industrial hygiene evaluation of the facility was performed by Bonus Environmental, LLC representative Jeff Walworth on May 18, 2010:

Bonus Environmental, LLC recommends that any areas of concerns outlined within this report be evaluated to ensure the necessary actions are made. Following the completion of the industrial hygiene evaluation, Bonus Environmental, LLC found the following safety and/or indoor air quality conditions of the facility to be within acceptable levels/condition in regards to the following:

- Carbon Dioxide
- Carbon Monoxide
- Lead Air Samples
- Water-Damage / Mold Growth
- Ergonomics
- Housekeeping
- Presumed Asbestos Containing Materials
- Temperature
- Relative Humidity

Air sampling was not conducted during this industrial hygiene evaluation for metal welding fumes, as this task was not performed during this industrial hygiene evaluation. It was reported to Bonus Environmental, LLC that welding activities are conducted approximately once per month, with a typical duration of 1-2 minutes. It is recommended that air sampling be performed during the next scheduled industrial hygiene evaluation for metal welding fumes if welding activities are conducted on a larger scale within this facility.

It has been a pleasure to be of assistance to you. Please contact us if you have any questions concerning this report or if we can be of any further assistance in any other environmental or occupational health matter.

Sincerely,

Non-Responsive [redacted]
Principal
Bonus Environmental, LLC

Non-Responsive [redacted]
Principal
Bonus Environmental, LLC

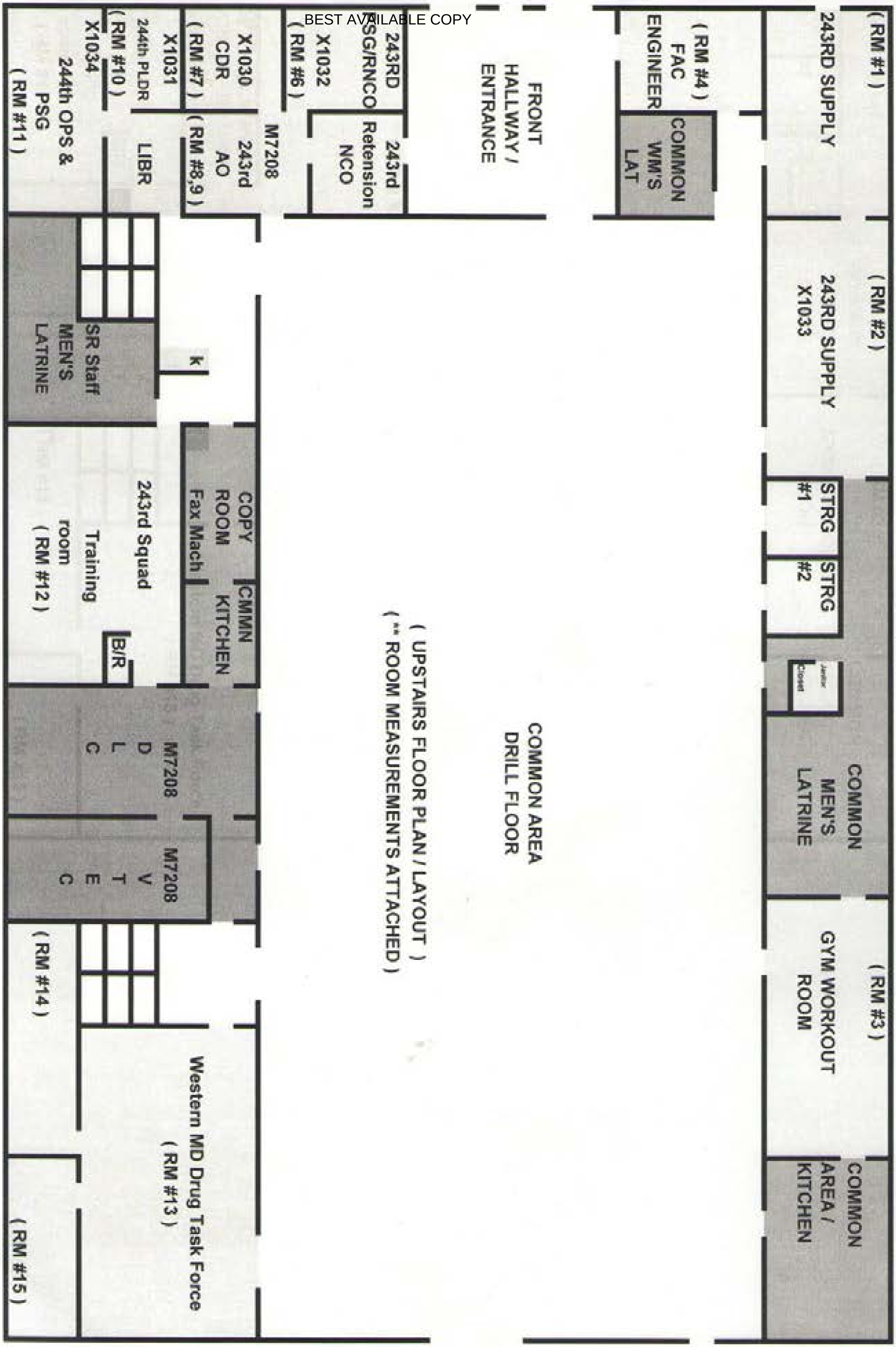
Cumberland_10_Report.docx

Appendix A

Shop Diagram

Armory Space Utilization

AS OF: 5/18/2010



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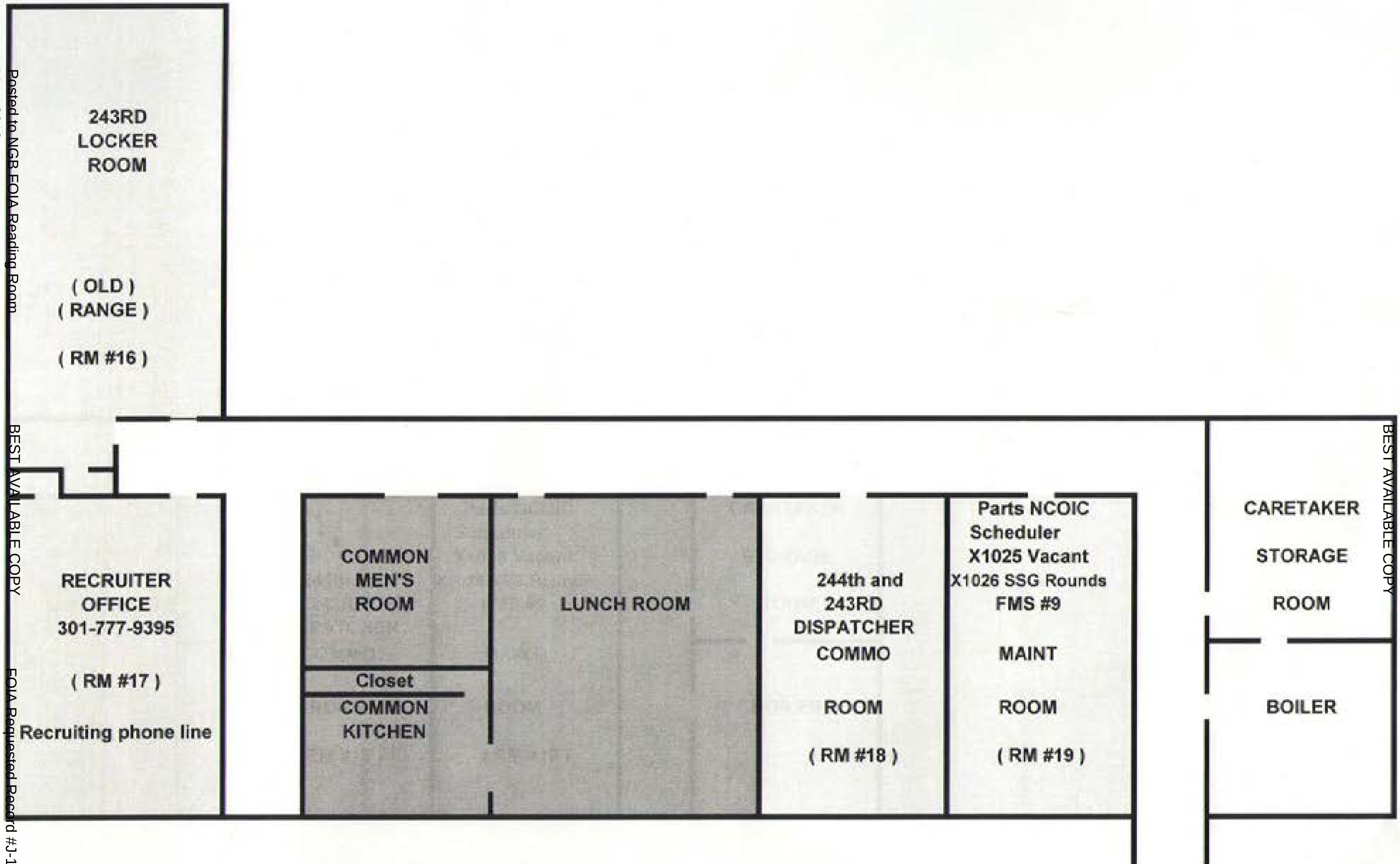

CONT. ON D2

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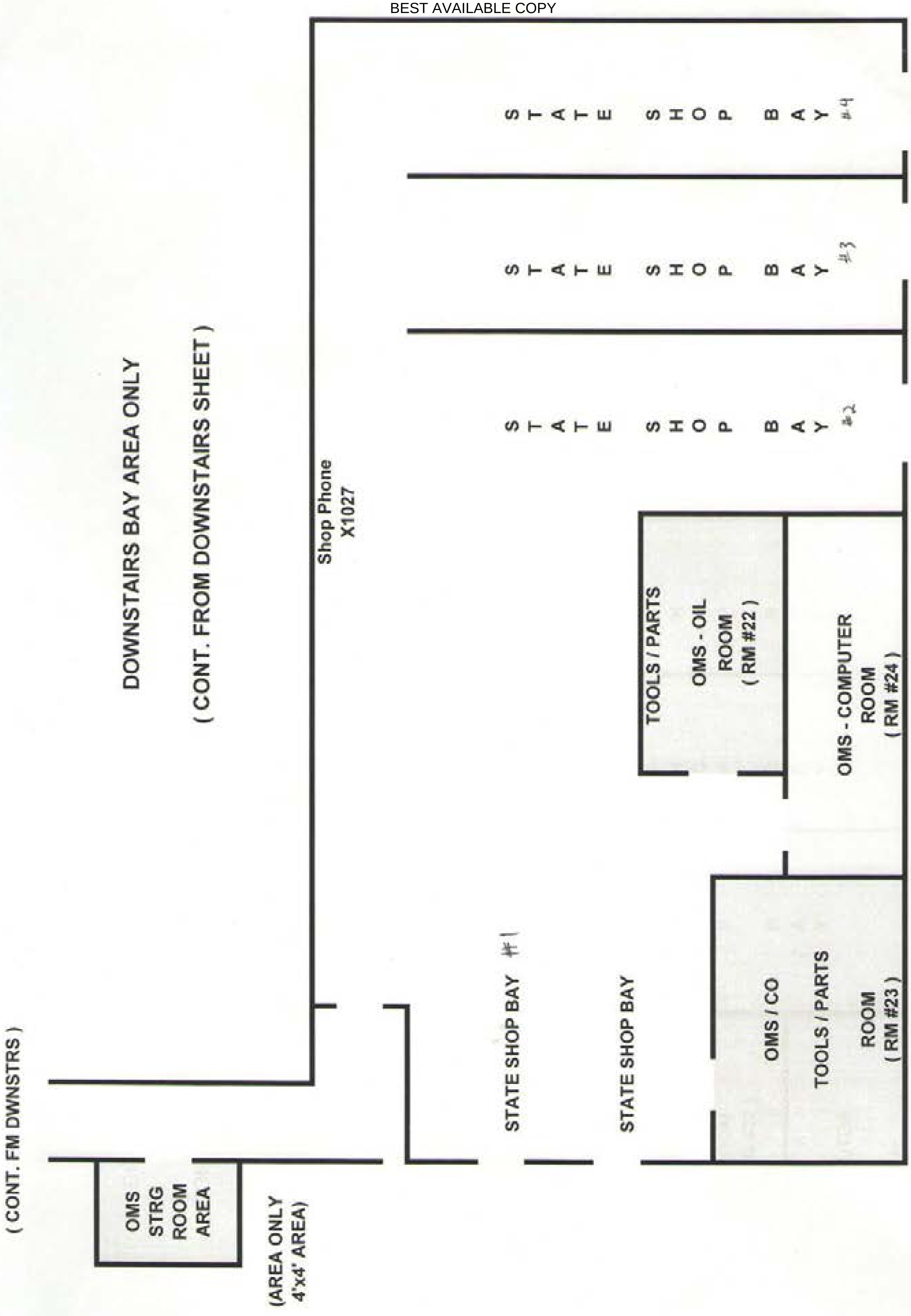
Armory Space Utilization

AS OF: 5/18/2010



Appendix B

Lead Sample Results

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

RECEIVED JUN 14 2010

ACCREDITED LABORATORY AIHA Environmental Lead See aihaiqap.org for details
100470
NY ELAP
10920

Client:	National Guard Bureau	**Job Name:**	Cumberland Armory	**Chain Of Custody:**	507190
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Cumberland, MD	**Date Submitted:**	5/21/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Cumberland Armory	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	5/28/2010
Attention:	[redacted]			**Report Date:**	6/1/2010

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
1047866	CL-PC-1	Flame	Paint Chip	****	N/A	0.0092	%Pb		0.22	%Pb	
1047867	CL-A-1	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1047868	CL-A-2	Flame	Air	920	N/A	3.3	ug/m³	<3	<3.3	ug/m³	
1047869	CL-A-3	Flame	Air	920	N/A	3.3	ug/m³	<3	<3.3	ug/m³	
1047870	CL-W-1	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
1047871	CL-W-2	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047872	CL-W-3	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047873	CL-W-4	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047874	CL-W-5	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047875	CL-W-6	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047876	CL-W-7	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047877	CL-W-8	Flame	Wipe	****	0.111	110	ug/ft²	16	140	ug/ft²	
1047878	CL-W-9	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047879	CL-W-10	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047880	CL-W-11	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047881	CL-W-12	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047882	CL-W-13	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047883	CL-W-14	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047884	CL-W-15	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	

An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA Accredited Laboratory — Environmental Lead — See aihaiqap.org for details — 100470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Cumberland Armory	**Chain Of Custody:**	507190
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation Havre de Grace, Maryland 21078	**Job Location:**	Cumberland, MD	**Date Submitted:**	5/21/2010
		Job Number:	Cumberland Armory	**Person Submitting:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	W912K6-09-A-0003	**Date Analyzed:**	5/28/2010
				Report Date:	6/1/2010

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments
1047885	CL-W-16	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047886	CL-W-17	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047887	CL-W-18	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047888	CL-W-19	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047889	CL-W-20	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047890	CL-W-21	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047891	CL-W-22	Flame	Wipe	****	0.111	110 ug/ft²	200	1800 ug/ft²	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)

%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

See QC Summary for analytical results of quality control samples associated with these sampes.

NY ELAP accreditation applies only to paint chip, wipe, and soil samples.

Analyst: Nida McGarvey

Technical Manager: G Edward Carney

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QC Summary

Sample Delivery Group: 19395

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	5/28/2010

	Result		Percent Recovery	RPD	Comment
Preparation Blank	-0.088	ppm			Acceptable
Report Limit Verification Sample	0.2719	ppm	81.6%		Acceptable
Expected Spike Level (ppm) 0.3333					
Duplicate Sample 1		mg/Kg			
Duplicate Sample 2		mg/Kg			Acceptable
Matrix Spike Analysis					
Spiked Sample					Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample 1	264.000	µg	103.85%		Acceptable
Laboratory Control Sample 2	304.125	µg	105.10%	1.20%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999829

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507190	47870	CL-W-1
507190	47871	CL-W-2

SDG Number: 19395

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507190	47872	CL-W-3
507190	47873	CL-W-4
507190	47874	CL-W-5
507190	47875	CL-W-6
507190	47876	CL-W-7
507190	47877	CL-W-8
507190	47878	CL-W-9
507190	47879	CL-W-10
507190	47880	CL-W-11
507190	47881	CL-W-12
507190	47882	CL-W-13
507190	47883	CL-W-14
507190	47884	CL-W-15
507190	47885	CL-W-16
507190	47886	CL-W-17
507190	47887	CL-W-18
507190	47888	CL-W-19
507190	47889	CL-W-20

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AMA Analytical Services, Inc.

Focused on Results!!

NVLAP 101143-0

NY ELAP 10920

AIHA 100470

Submitting Samples for National Guard Jobs

1) All samples shall be submitted to AMA Analytical Services, Attn: Sample Receiving, utilizing the enclosed Chain-of-Custody Form. The highlighted areas must be completed by the Subcontractor, however, the Sample Information/Analysis/Matrix section will not need to be completed if field date sheets are submitted with the samples. Please be sure to include a contact phone number for the person submitting the samples.
2) Results shall be reported via email to the following persons:
   a. National Guard Subcontracto[redacted] @ bonusenvironmental.com
   b. [redacted] CIV NGB: [redacted] @us.army.mil
   c. [redacted] CIV NGB [redacted] .army.mil
3) Hard Copy Reports & Invoices shall be handled in the following manner:
   a. Original Invoices and Copies of Reports shall be sent to the National Guard
      National Guard Bureau
      Attn: Shirley Chapman/Ken Forsythe
      301-IH Old Bay Lane
      Attn: NGB-AVN-SI, State Military Reservation
      Havre de Grace, Maryland 21078
   b. Original Reports shall be sent the National Guard Subcontractor

      Attn: [redacted]
      office: 989-779-7686
      cell: 989-621-3862

4) All Pb Wipes shall be handled in the following manner:
   a. All samples shall be analyzed utilizing FLAA procedures
   b. Samples whose results are reported as less than the reporting limit, and the reporting limit is greater than 40ug/ft2 shall be re-analyzed utilizing GFAA procedures.
5) All other samples – Pb Paints, Soils, & Airs, PCM Airs, PLM Bulks, TEM Airs, & TEM Bulks shall be analyzed utilizing standard analytical procedures

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Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

OWI (410) 247-2024

159202

CHAIN OF CUSTODY

507190

(Please Refer To This Number For Inquires)

Sheet 1 of 3

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Cumberland Armory
2. Job Location: Cumberland, MD
3. Job #: Cumberland Armory
4. Contact Perso[redacted] #: W912K6-09-A-0003
5. Submitted By: [redacted] @ phone #: (410) 942-0273

Signature: [redacted]

AFTER HOURS (must be pre-scheduled)
❑ Immediate Date Due: ______
❑ 24 Hours Time Due: ______
Comments: ______

Reporting Information (Results will be provided as soon as technically feasible):

NORMAL BUSINESS HOURS
❑ Immediate
❑ Next Day
❑ 2 Day
❑ 3 Day
☒ 5 Day + Date Due: 5-28-10
❑ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Inclu[redacted] Report
☒ [redacted]
❑ Fax: [redacted]
❑ Verba[redacted]
bonusenvironmental.com
s.army.mil
s.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
❑ NIOSH 7400 ______(QTY)
❑ Fiberglass ______(QTY)
TEM Air – Please Indicate Filter Type:
❑ AHERA ______(QTY)
❑ NIOSH 7402 ______(QTY)
❑ Other (specify ______) ______(QTY)
PLM Bulk
❑ EPA 600 – Visual Estimate ______(QTY)
❑ EPA Point Count ______(QTY)
❑ NY State Friable 198.1 ______(QTY)
❑ Grav. Reduction ELAP 198.6 ______(QTY)
❑ Other (specify ______) ______(QTY)
MISC
❑ Vermiculite
❑ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
❑ ELAP 198.4/Chatfield ______(QTY)
❑ NY State PLM/TEM ______(QTY)
❑ Residual Ash ______(QTY)
TEM Dust
❑ Qual. (pres/abs) Vacuum/Dust ______(QTY)
❑ Quan. (s/area) Vacuum D5755-95 ______(QTY)
❑ Quan. (s/area) Dust D6480-99 ______(QTY)
TEM Water
❑ Qual. (pres/abs) ______(QTY)
❑ ELAP 198.2/EPA 100.2 ______(QTY)
❑ EPA 100.1 ______(QTY)

☑ All samples received in good condition unless otherwise noted.
(TEM Water samples ______°C)

Metals Analysis
☒ Pb Paint Chip 1 (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 22 (QTY)
☒ Pb Air 3 (QTY)
❑ Pb Soil/Solid ______(QTY)
❑ Pb TCLP ______(QTY)
❑ Drinking Water ❑ Pb ____(QTY) ❑ Cu ____(QTY) ❑ As ____(QTY)
❑ Waste Water ❑ Pb ____(QTY) ❑ Cu ____(QTY) ❑ As ____(QTY)
❑ Pb Furnace (Media ______) ______(QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
❑ Spore-Trap ______(QTY)
❑ Surface Swab ______(QTY)
❑ Surface Tape ______(QTY)
❑ Other (Specify ______) ______(QTY)
❑ Surface Vacuum Dust ______(QTY)
❑ Culturable ID Genus (Media ______) ______(QTY)
❑ Culturable ID Species (Media ______) ______(QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
CL-PC-1	Boiler Rm	5-18	—	—				X			X					
CL-A-1	Field Blnk		0	—				X		X						
CL-A-2	Rm # 6		920	—				X		X						
CL-A-3	Maint. Garage		920	—				X		X						
CL-W-1	Field Blnk		—	—				X				X				
CL-W-2	Drill Hall		—	4"x4"				X				X				
CL-W-3	Drill Hall		—					X				X				
CL-W-4	Drill Hall		—					X				X				
CL-W-5	Drill Hall		—					X				X				
CL-W-6	Drill Hall		—					X				X				
CL-W-7	Kitchen		—					X				X				
CL-W-8	Locker Rm		—					X				X				

CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 5/21/10 @ 9:45 Via: FedEx By (Print): Surat Watson Sign: [signature]
2. Date/Time Analyzed: ___/___/___ @ ______ By (Print): ______ Sign: ______
3. Results Reported To: ______
4. Comments: ______ Via: Mail Date: 6/1/10 Time: 1905 Initials: [initials]

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OWI (410) 247-2024

159202 210 REV. 6.08

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) Sheet 2 of 3 **507190**

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Cumberland Armory
2. Job Location: Cumberland, MD
3. Job #: Cumberland Armory
4. Contact Pers[redacted] #: W912K6-09-A-0003
5. Submitted By[redacted] @ phone #: (410) 942-0273

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due: ______
☐ 24 Hours Time Due: ______
Comments: ______

Reporting Information (Results will be provided as soon as technically feasible):
NORMAL BUSINESS HOURS
☐ Immediate ☐ Next Day ☐ 2 Day
☐ 3 Day ☒ 5 Day + Date Due: 5-28-10
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

☒ Inclu[redacted]with Report
☒ Email
☐ Fax:
☐ Verba

REPORT TO:
@bonusenvironmental.com
@us.army.mil
@us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ______ (QTY)
☐ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ______ (QTY)
☐ NIOSH 7402 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ______ (QTY)
☐ EPA Point Count ______ (QTY)
☐ NY State Friable 198.1 ______ (QTY)
☐ Grav. Reduction ELAP 198.6 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ______ (QTY)
☐ NY State PLM/TEM ______ (QTY)
☐ Residual Ash ______ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
☐ Quan. (s/area) Dust D6480-99 ______ (QTY)
TEM Water
☐ Qual. (pres/abs) ______ (QTY)
☐ ELAP 198.2/EPA 100.2 ______ (QTY)
☐ EPA 100.1 ______ (QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples ______ °C)

Metals Analysis
☒ Pb Paint Chip 1 (QTY)
☒ Pb Dust Wipe (wipe type Ghost, 22 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ______ (QTY)
☐ Pb TCLP ______ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ______) ______ (QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
☐ Spore-Trap ______ (QTY)
☐ Surface Swab ______ (QTY)
☐ Surface Tape ______ (QTY)
☐ Other (Specify ______) ______ (QTY)
☐ Surface Vacuum Dust ______ (QTY)
☐ Culturable ID Genus (Media ______) ______ (QTY)
☐ Culturable ID Species (Media ______) ______ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
CL-W-9	Locker Rm	5-18	—	4"x4"				X								
CL-W-10	Locker Rm	↓	—	↓				X				X				
CL-W-11	Locker Rm		—					X				X				
CL-W-12	Stairway handrail		—					X				X				
CL-W-13	Fitness Rm		—					X				X				
CL-W-14	Supply Rm #2		—					X				X				
CL-W-15	Lobby		—					X				X				
CL-W-16	Office Rm 8,9		—					X				X				
CL-W-17	DLC Classroom		—					X				X				
CL-W-18	Lunch Rm		—					X				X				
CL-W-19	FMS Rm 19		—					X				X				
CL-W-20	Boiler Rm		—					X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 5/21/10 @ 9:45 Via: FedEx By (Print): Sarah Watson Sign: [signature]
2. Date/Time Analyzed: ___/___/___ @ ______ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ___/___/___ Time: ______ Initials: ______
4. Comments: ______

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

OWI (410) 247-2024

159202 210 REV. 6.08

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) Sheet 3 of 3

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Cumberland Armory
2. Job Location: Cumberland, MD
3. Job #: Cumberland Armory
4. Contact Perso[redacted] #: W912K6-09-A-0003
5. Submitted by: [redacted] @ phone #: (410) 942-0273

AFTER HOURS (must be pre-scheduled)
❑ Immediate Date Due: ______
❑ 24 Hours Time Due: ______
Comments: ______

Reporting Information (Results will be provided as soon as technically feasible):

NORMAL BUSINESS HOURS
❑ Immediate ❑ 3 Day
❑ Next Day ☒ 5 Day +
❑ 2 Day Date Due: ______
❑ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

Signature: [redacted]

REPORT TO:
☒ Inclu[redacted] with Report
☒ Email [redacted] @bonusenvironmental.com
❑ Fax: [redacted] @us.army.mil
❑ Verbal [redacted] @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
❑ NIOSH 7400 ______ (QTY)
❑ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
❑ AHERA ______ (QTY)
❑ NIOSH 7402 ______ (QTY)
❑ Other (specify ______) ______ (QTY)
PLM Bulk
❑ EPA 600 – Visual Estimate ______ (QTY)
❑ EPA Point Count ______ (QTY)
❑ NY State Friable 198.1 ______ (QTY)
❑ Grav. Reduction ELAP 198.6 ______ (QTY)
❑ Other (specify ______) ______ (QTY)
MISC
❑ Vermiculite
❑ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
❑ ELAP 198.4/Chatfield ______ (QTY)
❑ NY State PLM/TEM ______ (QTY)
❑ Residual Ash ______ (QTY)
TEM Dust
❑ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
❑ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
❑ Quan. (s/area) Dust D6480-99 ______ (QTY)
TEM Water
❑ Qual. (pres/abs) ______ (QTY)
❑ ELAP 198.2/EPA 100.2 ______ (QTY)
❑ EPA 100.1 ______ (QTY)

❑ All samples received in good condition unless otherwise noted. (TEM Water samples ______ °C)

Metals Analysis
☒ Pb Paint Chip 1 (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 22 (QTY)
☒ Pb Air 3 (QTY)
❑ Pb Soil/Solid ______ (QTY)
❑ Pb TCLP ______ (QTY)
❑ Drinking Water ❑ Pb ____ (QTY) ❑ Cu ____ (QTY) ❑ As ____ (QTY)
❑ Waste Water ❑ Pb ____ (QTY) ❑ Cu ____ (QTY) ❑ As ____ (QTY)
❑ Pb Furnace (Media ______) ______ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
❑ Spore-Trap ______ (QTY)
❑ Surface Swab ______ (QTY)
❑ Surface Tape ______ (QTY)
❑ Other (Specify ______) ______ (QTY)
❑ Surface Vacuum Dust ______ (QTY)
❑ Culturable ID Genus (Media ______) ______ (QTY)
❑ Culturable ID Species (Media ______) ______ (QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
CL-W-21	Garage, Bay 2	5-18	—	4"x4"				X				X				
CL-W-22	Battery Rm	↓	—	↓				X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: ___/___/___ @ ___ Via: ______ By (Print) ______
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print) ______ Sign: ______
3. Results Reported To: ______ Sign: ______
4. Comments: ______ Via: ______ Date: ___/___/___ Time: ______ Initials: ______

Appendix C

Photographs

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Building exterior, south entrance


Building exterior, east side


Drill Hall


Boiler Room


Boiler Room, west wall, peeling lead based paint


Maintenance Garage, parts cleaner

Maintenance Garage, safety board


Battery Shop, exhaust grill on west wall


Battery Shop


Maintenance Garage, vehicle exhaust system

Maintenance Garage, flammable storage cabinet

Appendix D

References

1. Department of Defense Instruction (0001) 6055.1, Department of Defense Occupational Safety and Health (OS H) Program, August 19, 1998.

2. Army Regulation (AR) 11-34, The Army Respiratory Protection Program, February 15, 1990.

3. DA PAM 40-503, Medical Service, Industrial Hygiene Program, October 30, 2000.

4. Technical Manual (T.M) 5-810-1, Mechanical Design, Heating, Ventilation, and Air Conditioning, June 1991.

5. Threshold Limit Values (TLVs) and Biological Exposure Indices (BEls), American Conference of Governmental Industrial Hygienists (ACGIH), current edition.

6. Industrial Ventilation - A Manual of Recommended Practices, American Conference of Governmental Industrial Hygienists (ACGIH), current edition.

7. UFC 3-410-01 FA Heating, Ventilating, and Air Conditioning, 15 May 2003

8. Occupational Safety and Health Administration (OSHA) Lead in Construction Standard, 29 CFR 1926.62

9. OSHA Lead Standard 29 CFR 1910.1025

10. OSHA Respiratory Protection Standard 29 CFR 1910.134

11. Army Regulation (AR) 385-10, The Army Safety Program, August 23, 2007.

12. RP-1-2004, Office Lighting, Illuminating Engineering Society of North America (IESNA)/ANSI.

13. RP-7-2001, Industrial Lighting, (IESNA)/ANSI.

14. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Standard 62.1-2007, "Ventilation for Acceptable Indoor Air Quality".

15. ASHRAE Standard 55-2004 – "Thermal Environmental Conditions for Human Occupancy"

16. Title 24, CFR, Part 35, Subpart B, Sections 35.110, Definitions of Lead-Based Paint, Housing and Urban Development, U.S. Department of Housing.

17. OSHA Personal Protective Equipment 29 CFR 1910.132

18. OSHA Permissible Exposure Limit (PEL) for General Industry 29 CFR 1910.1000 Z-1 Table

19. Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Department of Health and Mental Hygiene, November 2008.

20. Mold Remediation in Schools and Commercial Buildings, U.S. Environmental Protection Agency, March 2001

21. Army Facilities Management Information Document on Mold Remediation Issues TG277, February 2002

22. OSHA Welding, Cutting, Brazing 29 CFR 1910.252

COMPLIANCE MANAGEMENT INTERNATIONAL

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Mechanicsburg, PA 17055
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Fax: 717.590.7936
www.complianceplace.com

Industrial Hygiene Survey Report

National Guard Facility
Cumberland Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Cumberland Readiness Center** **1100 Brown Avenue** **Cumberland, MD 21502**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**June 4, 2013**
Report Date:	**July 2, 2013**

Non-Responsive [redacted]

Non-Responsive [redacted]
Senior Industrial Hygienist

Table of Contents

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on June 4, 2013, at the Cumberland Readiness Center located at 1100 Brown Avenue, Cumberland, MD 21502. The survey was performed by Mr. [redacted].

1. Lead surface, bulk, and air samples were collected. Surface levels of lead were below 200 micrograms per square foot (ug/ft^2) in all locations sampled. See Section 3.0 for detailed sampling results.

2. Lighting levels did not meet the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in two locations. See Section 4.0 for detailed findings.

3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.

   a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in the areas sampled.

   b. The relative humidity levels met the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in all occupied areas sampled.

   c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 ppm.

   d. Carbon dioxide ($CO_{2)}$ levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings.

4. Several areas have suspect asbestos containing material (ACM) floor tiles. Black floor tile mastic was sampled and found to contain 3% chrysotile asbestos. See Section 6.0 for detailed findings.

Section 2.0 Operation Description & Observations

The Cumberland Readiness Center is mainly an administrative facility with a drill hall, offices, distance learning center, and a converted firing range area (currently wall locker storage room). There were approximately 2 full-time employees stationed at this facility at the time of this survey. It was reported that in 2009 a new roof and gas to hot water heating system were installed. There is an FMS facility at this location.

The building is reported to have been built in 1960. It is a two-story structure. The exterior is brick. The interior walls are concrete block, plaster, and paneling with drywall in some of the offices. The floors are concrete, carpet, 9”X9” and 12”X12” floor tiles.

The heating system consists of a gas-fired hot water generating unit. There is no central A/C system; some portable A/C units are present in the facility.

There is no child-care facility in the building.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared to be properly designed. Personnel had supportive chairs.

This facility has a converted firing range that is now used to store wall lockers.

It was reported that the new heating system (2009) dose not have thermostat controls on one side of the building, the distant learning center side of the building, which is causing temperature extremes in the facility.

This facility has some areas of localized damaged and missing 9”X9” asbestos floor tile, < 10% of the total floor tile. The areas of missing floor tiles have exposed black mastic.

House keeping practices were good.

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Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 um mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2
1	Drill Hall	<6.7	*
2	Converted Firing Range/Wall Locker Storage	<6.7	*
3	Drill Hall – Floor	*	<110
4	Drill Hall – Top of Pepsi Machine	*	<110
5	Drill Hall – Top of Table	*	<110
6	Kitchen – Top of Refrigerator	*	<110
7	Kitchen – Top of Toaster Oven	*	<110
8	Converted Firing Range/Wall Locker Storage – Floor	*	<110
9	Converted Firing Range/Wall Locker Storage – Top of Wall Locker	*	<110
10	Hallway – Floor outside of Converted Firing Range/Wall Locker Storage	*	<110
11	Room 5 Lounge – Top of Bar	*	<110
12	Basement Hallway – Top of Heating Radiator	*	<110
13	Room 14 Office – Top of Desk	*	<110
14	Distant Learning Center – Top of TV	*	<110
15	Room 11 – Office Top of Book Shelf	*	<110
16	Room 2 243rd Supply – Top of File Cabinet	*	<110
17	Blank - Wipe	*	<12
18	Blank - Air	<3	*
-	**Criteria**	**50**	**200**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2 =** micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Sources:

1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges

2. OSHA 29CFR1910.1025 Lead Standard

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 "Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Lead surface and air samples were collected. The following is a summary of the sample results from this survey.

- Surface levels of lead were below the recommended guideline of 200 ug/ft^2 in all of the locations sampled

- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m^3).

- No Chipping or Peeling paint was observed at the time of the inspection.

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Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98011EL). The light meter was last calibrated in November 2012. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Drill Hall	23.8	10	Yes
Kitchen	**24.4**	**50**	**No**
Gym	40.4	30	Yes
Men’s Bathroom	28.6	5	Yes
Room 2 243rd Supply	80.5	30	Yes
Room 1 243rd Supply	**20.2**	**30**	**No**
Room 8/9 Office	72.7	30-50	Yes
Room 10 Office	36.6	30-50	Yes
Room 11 Office	35.7	30-50	Yes
Copy Room	25.1	10	Yes
Distant Learning Center	84.1	50	Yes
Room 14 Office	66.3	30-50	Yes
Lounge	31.9	10	Yes
Converted Firing Range/Wall Locker Storage	61.3	30	Yes

Table Notes:

1. FC = Foot Candles
2. **Bolded** results did not meet listed criteria

Source: ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

The lighting level did not meet the minimum recommended guideline in the kitchen, and room one. Lighting should be improved in these areas.

Section 5.0 Indoor Air Quality

Survey measurements were made for comfort parameters and ventilation (temperature, relative humidity, carbon dioxide, and carbon monoxide). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7575-X (Serial #1228008). The IAQ Meter was last calibrated in July 2012.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2010). ASHRAE specifies temperature ranges for human comfort (ASHRAE 55-2010). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60%.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Room 14 Office	70.0	55.8	553	0.0
Distant Learning Center	73.3	41.4	393	0.0
Room 2 243rd Supply	73.2	42.0	378	0.0
Outdoors	67.0	35.1	352	0.0
Criteria	**68-79**	**30-60**	**<1,052**	**<9**

Table Notes:
1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **°F =** degrees Fahrenheit

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements met the recommended 68-79°F in all occupied areas.

- Relative humidity levels met the recommended guidelines in all sampled areas. Relative humidity should be maintained at 30-60%.

- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level for this survey. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,052 ppm. This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide

- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. The following observation were noted:

  - It was reported that the new heating system (2009) dose not have thermostat controls on one side of the building, the distant learning center side of the building, which is causing temperature extremes in the facility.

Section 6.0 Suspect Asbestos Containing Building Materials

The following suspect ACM was noted at the time of this survey:

1. The facility has 9”X9” floor tiles in most rooms green, black, and red.

2. The following areas have localized <10% of the total floor tile present, damaged or missing floors tiles exposing the black mastic, and should be repaired:
   - Room 12 approximately 10 missing tiles
   - Room 2 243rd supply approximately 45 missing tiles

A bulk sample was collected from room 12 of the black mastic where the 9”X9” floor tiles are missing. The laboratory results showed that the mastic contained 3% chrysotile asbestos.

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

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Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98011EL	11/2012	NA
SKC Air Sampling Pump	647598	6/4/13	2.5 LPM
SKC Air Sampling Pump	648349	6/4/13	2.5 LPM

Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

Appendix A. Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY
INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org
LAB #100470

Client:	National Guard Bureau	**Job Name:**	ARNG-MD	**Chain Of Custody:**	516067
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Cumberland RC	**Date Submitted:**	6/10/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	[redacted]
				Report Date:	6/12/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
13068537	1	Flame	Air	450	N/A	6.7	ug/m^3	<3	<6.7	ug/m^3	
13068538	2	Flame	Air	450	N/A	6.7	ug/m^3	<3	<6.7	ug/m^3	
13068539	3	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068540	4	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068541	5	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068542	6	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068543	7	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068544	8	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068545	9	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068546	10	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068547	11	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068548	12	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068549	13	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068550	14	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068551	15	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068552	16	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
13068553	17	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13068554	18	Flame	Air Blank	0	N/A	3	ug/m^3		<3	ug	

An AIHA (#100470) an[illegible]ccredited Laboratory
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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #100470

Client:	National Guard Bureau	**Job Name:**	ARNG-MD	**Chain Of Custody:**	516067
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Cumberland RC	**Date Submitted:**	6/10/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	6/12/2013 **Report Date:** 6/12/2013
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Total ug	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)

%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: Suphin Chinnapad

Technical Manager: G Edward Carney

OWI (410) 247-2024   159202   210 REV. 6.08

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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 516067

page 1 of 2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Arnold MD
2. Job Location: Cumberland RC
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Pers[redacted] @ phone # (410) 942-0273
5. Submitted By [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate
☐ Next Day
☐ 2 Day
☐ 3 Day
☒ 5 Day + Date Due: 6/17/13
☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

REPORT TO:
☒ Incl[redacted]th Report
☒ [redacted] us.army.mil
☐ Fax: [redacted] us.army.mil
☐ Verb[redacted]

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ______ (QTY)
☐ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ______ (QTY)
☐ NIOSH 7402 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
PLM Bulk
☒ EPA 600 – Visual Estimate 1 (QTY)
☐ EPA Point Count ______ (QTY)
☐ NY State Friable 198.1 ______ (QTY)
☐ Grav. Reduction ELAP 198.6 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ______ (QTY)
☐ NY State PLM/TEM ______ (QTY)
☐ Residual Ash ______ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
☐ Quan. (s/area)Dust D6480-99 ______ (QTY)
TEM Water
☐ Qual. (pres/abs) ______ (QTY)
☐ ELAP 198.2/EPA 100.2 ______ (QTY)
☐ EPA 100.1 ______ (QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples ______ °C)

Metals Analysis
☐ Pb Paint Chip ______ (QTY)
☐ Pb Dust Wipe (wipe type Ghost) 15 (QTY)
☐ Pb Air 2 (QTY)
☐ Pb Soil/Solid ______ (QTY)
☐ Pb TCLP ______ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ______) ______ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ Spore-Trap ______ (QTY)
☐ Surface Swab ______ (QTY)
☐ Surface Tape ______ (QTY)
☐ Other (Specify ______) ______ (QTY)
☐ Surface Vacuum Dust ______ (QTY)
☐ Culturable ID Genus (Media ______) ______ (QTY)
☐ Culturable ID Species (Media ______) ______ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1 Drill Hall		6-4	450					X		X						
2 Commercial	Range		450					X		X						
3 Drill Hall - floor				100 cm2				X				X				
4 Drill Hall - Repair Machine								X				X				
5 Drill Hall	Table							X				X				
6 Kitchen Top	of Fridge							X				X				
7 Kitchen Top	of toaster oven							X				X				
8 Commercial Range	Floor							X				X				
9 Commercial Range	locker							X				X				
10 Hallway Range	floor							X				X				
11 Room 5	lounge							X				X				
12 Basement Hall - Heater																

Tube lid not secured when receipt (Nicole)

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 6/10/13 @ 910 Via: FedEx By (Print): NMM Sign:
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ___ Sign:
3. Results Reported To: [illegible] Via: ___ Date: ___/___/___ Time: ___ Initials:

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AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) S116067
page 2 of 2

Mailing/Billing Information:

1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:

1. Job Name: ARNG MD
2. Job Location: Cumberland RC
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person: [redacted] @ p[redacted]0273
5. Submitted By: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS			REPORT TO:
☐ Immediate Date Due:	☐ Immediate	☐ 3 Day	☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)	☒ Include COC/Field Data Sheets with Report
☐ 24 Hours Time Due:	☐ Next Day	☐ 5 Day +		☒ E[redacted]@us.army.mil
Comments:	☐ 2 Day	Date Due:		☐ Fa[redacted]@us.army.mil
				☐ V[redacted]

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
- ☐ NIOSH 7400 ____(QTY)
- ☐ Fiberglass ____(QTY)

TEM Air – Please Indicate Filter Type:
- ☐ AHERA ____(QTY)
- ☐ NIOSH 7402 ____(QTY)
- ☐ Other (specify____) ____(QTY)

PLM Bulk
- ☐ EPA 600 – Visual Estimate ____(QTY)
- ☐ EPA Point Count ____(QTY)
- ☐ NY State Friable 198.1 ____(QTY)
- ☐ Grav. Reduction ELAP 198.6 ____(QTY)
- ☐ Other (specify____) ____(QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
- ☐ ELAP 198.4/Chatfield ____(QTY)
- ☐ NY State PLM/TEM ____(QTY)
- ☐ Residual Ash ____(QTY)

TEM Dust
- ☐ Qual. (pres/abs) Vacuum/Dust ____(QTY)
- ☐ Quan. (s/area) Vacuum D5755-95 ____(QTY)
- ☐ Quan. (s/area)Dust D6480-99 ____(QTY)

TEM Water
- ☐ Qual. (pres/abs) ____(QTY)
- ☐ ELAP 198.2/EPA 100.2 ____(QTY)
- ☐ EPA 100.1 ____(QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____°C)

Metals Analysis
- ☐ Pb Paint Chip ____(QTY)
- ☐ Pb Dust Wipe (wipe type____) ____(QTY)
- ☐ Pb Air ____(QTY)
- ☐ Pb Soil/Solid ____(QTY)
- ☐ Pb TCLP ____(QTY)
- ☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Pb Furnace (Media ____) ____(QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
- ☐ Spore-Trap ____(QTY) ☐ Surface Vacuum Dust ____(QTY)
- ☐ Surface Swab ____(QTY) ☐ Culturable ID Genus (Media____) ____(QTY)
- ☐ Surface Tape ____(QTY) ☐ Culturable ID Species (Media____) ____(QTY)
- ☐ Other (Specify____) ____(QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13 Room 14	Desk	6-9		1sq ft				X				X				
14 Learning Center TV								X				X				
15 Rm 11 Book Shelf								X				X				
16 Break Rm File Cabinet								X				X				
17 Blank – Wipe				0				X				X				
18 Blank – Air			0					X		X						
19 Bulk Asbestos Floor tile	mastic 3rd						X									

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY: (CUSTODY)

1. Date/Time RCVD: ___/___/___ @ ___ Via: ___ By (Print): ___ Sign:
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ___ Sign: ___
3. Results Reported To: ___ Via: ___ Date: ___/___/___ Time: ___ Initials: ___

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

Client:	National Guard Bureau	**Job Name:**	ARNG-MD	**Chain Of Custody:**	516067
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Cumberland RC	**Date Analyzed:**	6/14/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003		

Attention: [redacted]

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments
13068555	19	3	3	--	--	--	--	--	--	--	--	97	MS	Black	Homogeneous	LBP	

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

NAD = "No Asbestos Detected" TR = "Trace equals less than 1% of this component"

Uncertainty: For samples containing asbestos in range of 1-10% the CV is 0.43, 11-35% CV=0.55, >35 CV=0.23

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Technical Director Peerawut Chaikeenee

Analyst(s) Lom Butruk

Lom Butruk

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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 516067

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: ARNG - MD
2. Job Location: Cumberland RC
3. Job #: [redacted] #: W912K6-09-A-0003
4. Contact Person [redacted] @ ph[redacted]0273
5. Submitted by: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
NAM
☒ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day + Date Due: 6/17/13
☐ 2 Day
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ In[redacted] with Report
☒ [redacted] @ compliance.com
☐ F[redacted] @us.army.mil
☐ V[redacted] @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☒ EPA 600 – Visual Estimate 1 (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area)Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)
☒ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☐ Pb Dust Wipe (wipe type Ghost) 15 (QTY)
☐ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1 Drill Hall		6-4	450					X		X						
2 Convertral Range			450					X		X						
3 Drill Hall - floor				100cm2				X				X				
4 Drill Hall - Pepsi Machine								X				X				
5 Drill Hall - Table								X				X				
6 Kitchen - Top of Fridge								X				X				
7 Kitchen - Top of toaster oven								X				X				
8 Converted Range - Floor								X				X				
9 Convertal Range - locker								X				X				
10 Hallway Range - floor								X				X				
11 Room 5 - lounge								X				X				
12 Basement Hall - Heater																

Tube lid not secured when receipt (Nitrile)

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY CHAIN OF CUSTODY
1. Date/Time RCVD: 6/10/13 @ 910 Via: FedEx By (Print): NAM Sign:
2. Date/Time Analyzed: 6/17/13 @ 8:30 By (Print): Lom Butruk Sign: Lom Butruk
3. Results Reported To: Shirley Chapman Via: Email Date: 6/17/13 Time: Initials:
4. Comments: 7945 0138 5859 9160

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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) S160607

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: ARNG · MD
2. Job Location: Cumberland RC
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person: [redacted] @ phone #: (410) 942-0273
5. Submitted by: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ____ ☐ 24 Hours Time Due: ____ Comments: ____	☐ Immediate ☐ 3 Day ☐ Next Day ☐ 5 Day + ☐ 2 Day Date Due: ____ ☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)	☒ Include COC/Field Data Sheets with Report ☒ Email: [redacted] us.army.mil ☐ Fax: [redacted] us.army.mil ☐ Verbal: [redacted]

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
- ☐ NIOSH 7400 ____ (QTY)
- ☐ Fiberglass ____ (QTY)

TEM Air – Please Indicate Filter Type:
- ☐ AHERA ____ (QTY)
- ☐ NIOSH 7402 ____ (QTY)
- ☐ Other (specify ____) ____ (QTY)

PLM Bulk
- ☐ EPA 600 – Visual Estimate ____ (QTY)
- ☐ EPA Point Count ____ (QTY)
- ☐ NY State Friable 198.1 ____ (QTY)
- ☐ Grav. Reduction ELAP 198.6 ____ (QTY)
- ☐ Other (specify ____) ____ (QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
- ☐ ELAP 198.4/Chatfield ____ (QTY)
- ☐ NY State PLM/TEM ____ (QTY)
- ☐ Residual Ash ____ (QTY)

TEM Dust
- ☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
- ☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
- ☐ Quan. (s/area)Dust D6480-99 ____ (QTY)

TEM Water
- ☐ Qual. (pres/abs) ____ (QTY)
- ☐ ELAP 198.2/EPA 100.2 ____ (QTY)
- ☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
- ☐ Pb Paint Chip ____ (QTY)
- ☐ Pb Dust Wipe (wipe type ____) ____ (QTY)
- ☐ Pb Air ____ (QTY)
- ☐ Pb Soil/Solid ____ (QTY)
- ☐ Pb TCLP ____ (QTY)
- ☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
- ☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
- ☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
- ☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
- ☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13 Room 14	Desk	6-4		100 cm²				X				X				
14 Learning Center · TV								X				X				
15 Rm 11 · Book Shelf								X				X				
16 Room 2 · File Cabinet								X				X				
17 Blank - Wipe				0				X				X				
18 Blank · Air			0					X		X						
19 Bulk · Asbestos · Floor tile	mastic · Black						X									

CLIENT CONTACT
(LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY (CUSTODY)

1. Date/Time RCVD: ____ / ____ / ____ @ ____ Via: ____ By (Print): ____ Sign: ____
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ____ / ____ / ____ Time: ____ Initials: ____
4. Comments: ____

Appendix B. Photographs

Exterior of facility

Drill Hall

Converted firing range/wall locker storage area

One of two locations of missing 9”X9” floor tile exposing black mastic, this location is room 2, 243rd supply room, the other location is room 12

Appendix C. Floor Plan

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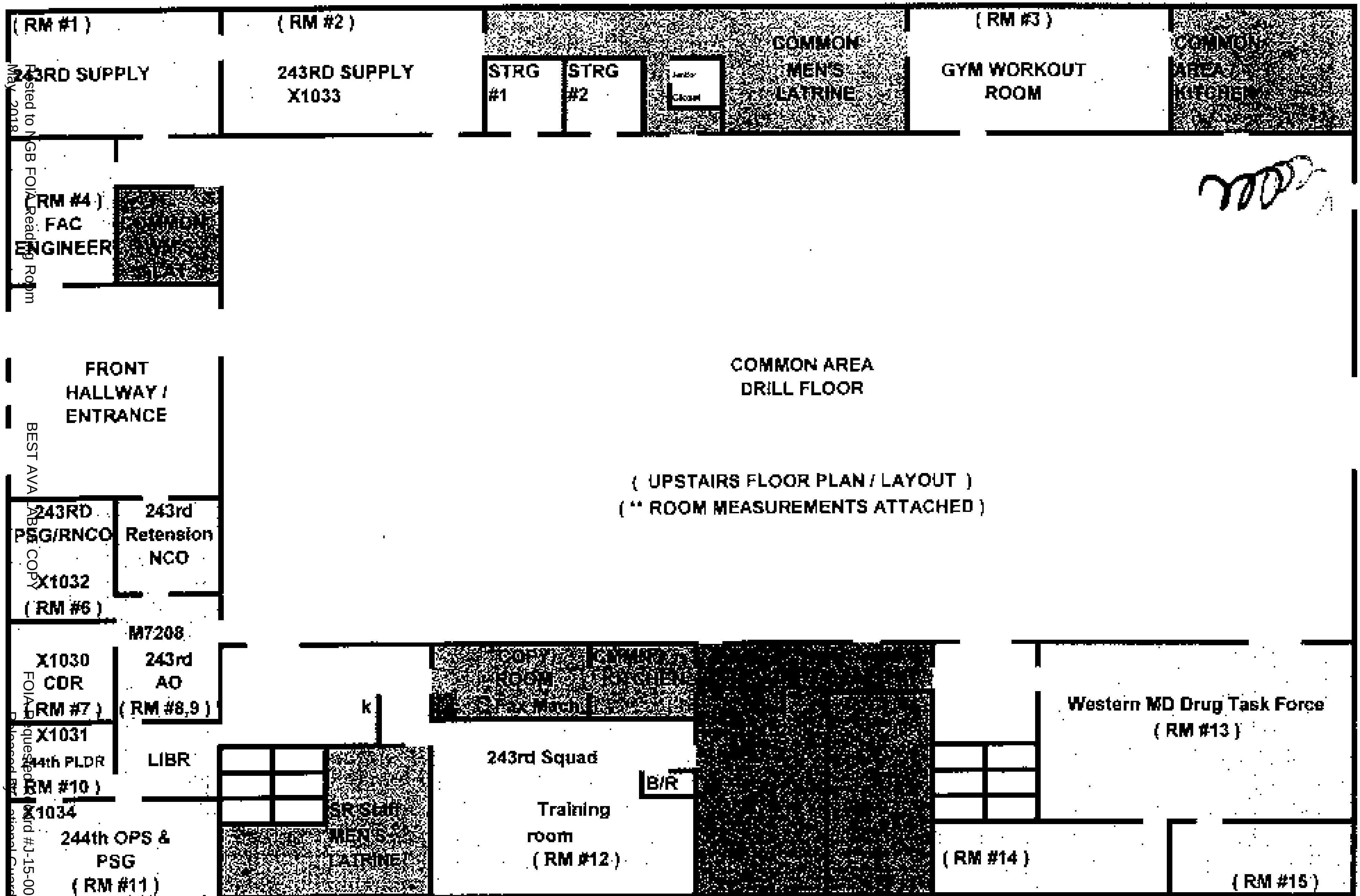
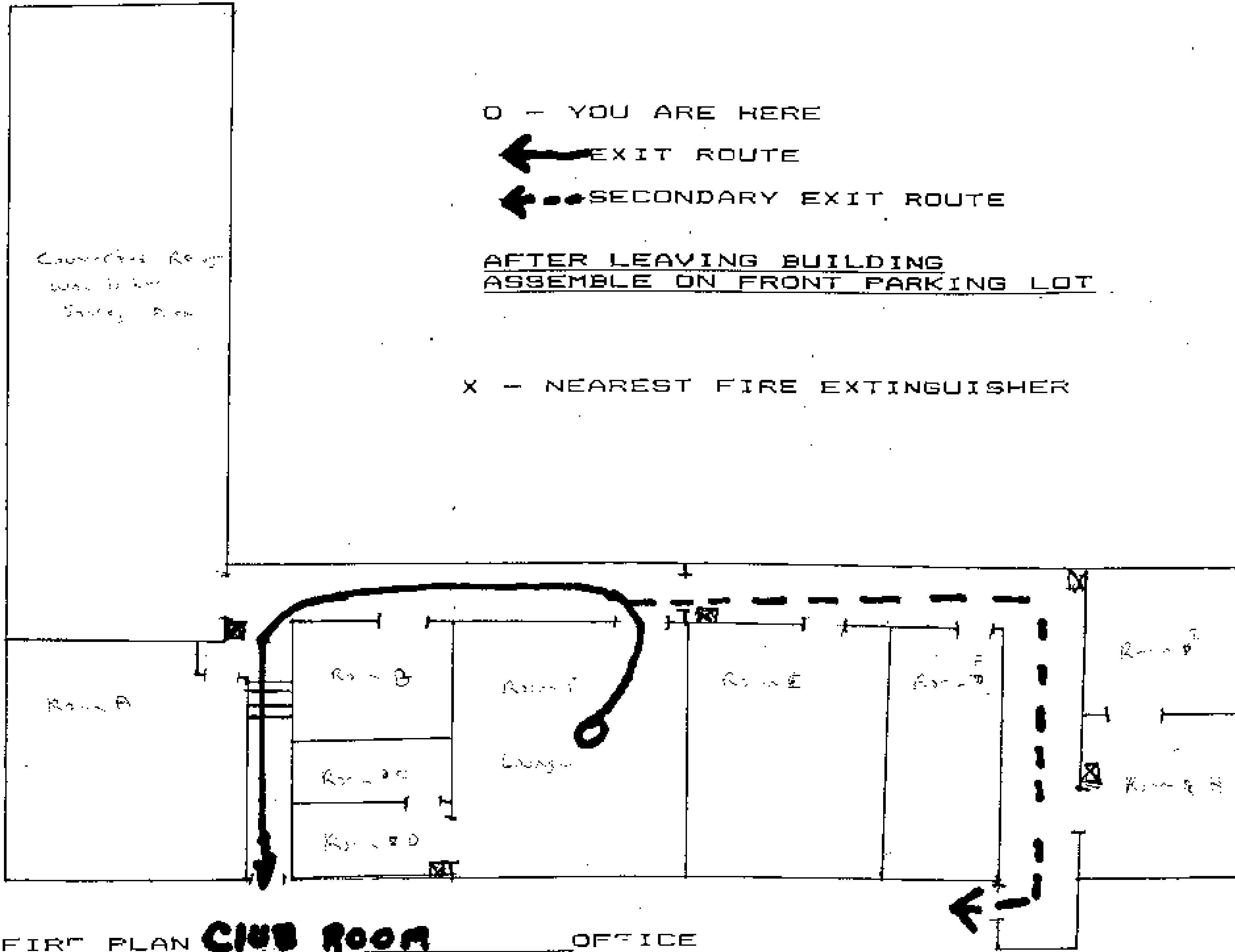
Armory Space Utilization

AS OF: 10/26/2011





FIRE PLAN **CLUB ROOM** OFFICE

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Appendix D. References

1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead.

2. American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2011 Edition.

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition.

4. ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2010.

5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.

6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.

7. National Emission Standard Hazardous Air Pollutants (NESHAP) – The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

8. National Ambient Air Quality Standards (NAAQS) - National primary ambient air quality standards for carbon monoxide 40 CFR 50.8.

9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h) (3)].

10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM).

11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.

12. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.

13. ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

MEMORANDUM FOR Region North Industrial Hygiene Office (NGB-AVS-SI-IH/ Ms. [redacted]), Army National Guard Bureau, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, SGM Jerome Maynard Grollman Armory, Dundalk, MD, Project No. 55-ML-01ED-03/05

1. Enclosed is the final copy of the subject report and two CD-ROMs.

2. The project number for this service reflects the current fiscal year of dispatch and the actual field work which was completed for fiscal year 2003. The State of Maryland Army National Guard occupational health nurse was immediately notified in writing of findings necessitating immediate corrective action in Maryland armories. In addition, the National Guard Bureau Region North Industrial Hygiene Office has been notified of all the results of lead in dust sampling conducted in all facilities. Draft reports were reviewed by you or other members of the National Guard and members of this Center, including our editorial staff, during drafting stages in report preparation leading up to the final report.

3. Our point of contact is Ms. [redacted] at commercial 410-436-5475/3118, DSN 584-5475/3118, or electronic mail: [redacted]@us.army.mil

FOR THE COMMANDER:

[redacted]

Encl

Director, Occupational Health Sciences

Readiness thru Health

Printed on Recycled Paper

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEYS
DUNDALK ARMORY
DUNDALK, MD
PROJECT NO. 55-ML-01ED-03/05
23 JULY 2003

1. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard facilities to identify and measure the existence and extent of potentially hazardous operations or conditions at these facilities. The survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee.

2. FINDINGS.

a. Lead. Lead levels in dust exceeded the recommended limit in several areas of the building. Higher results in the former indoor firing range (IFR) indicate that it was not properly decontaminated when it was converted to a storage area. Personnel working in the former IFR are exposed to lead on stored materials and track lead into other areas of the armory and into their own vehicles and homes. Lead-contaminated paint has begun to deteriorate and will continue to do so unless it is stabilized. Falling paint is likely to contribute to the levels of lead in dust. Lead in dust sample results from several areas in the armory greatly exceeded the regulatory limits for children under 6 years of age. Although children are unlikely to occupy this armory for more than the minimum 60 hours per year required for the regulatory limits to apply, we believe that these conditions pose a significant health hazard from lead exposure to children using this facility that warrants clean-up to these limits before allowing children to continue to use it.

b. Asbestos. All known asbestos in the armory has been abated.

c. Lighting. All areas were judged to be adequately lit except for Room 102 A.

3. RECOMMENDATIONS.

a. Lead. The Risk Assessment Codes (RACs) for health hazards due to lead exposure were assessed as 3 for adult exposure and 2 for child exposure. To minimize exposure to lead develop and implement a written Lead Hazard Management Plan for Dundalk Armory. Ensure that the armory is in compliance with the Occupational Safety and Health Administration (OSHA) general industry lead standard, Title 29 Code of Federal Regulations (CFR) Part 1910.1025, and the OSHA Lead in Construction Standard, Title 29 CFR Part 1926.62. Address all potential lead

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hazards before continuing to extend the use of this facility to children. If children will continue to use this facility, clean surfaces to the Environmental Protection Agency and State of Maryland lead in dust standards. Discontinue events and advertising until cleanup is completed. Clean all areas where sampling results showed elevated levels of lead. At a minimum, if only adults use this facility, clean to the recommended safe levels for adults. Follow the comprehensive guidelines for cleaning in Appendix E. Follow the decontamination requirements for the IFR in the Addendum to National Guard Bureau All States Letter P01-0075. Consult with the Maryland Armory Environmental Coordinator concerning disposal requirements after cleanup. Stabilize the deteriorated paint on the walls. Pending clean-up, restrict access to the former IFR by keeping it locked. Post a sign warning against use of the room except in an emergency. Ensure that personnel wear disposable gloves and disposable coveralls to prevent tracking lead out when working in the former IFR.

b. Lighting. The RAC for health hazards associated with inadequate illumination was assessed as 5. Increase lighting levels in Room 102 A to 28-46 foot candles to conform to the Illuminating Engineering Society of North America guidelines.

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEYS
DUNDALK ARMORY
DUNDALK, MD
PROJECT NO. 55-ML-01ED-03/05
23 JULY 2003

1. REFERENCES. See Appendix A.

2. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard facilities to identify and measure the existence and extent of potentially hazardous operations or conditions. The survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee.

3. AUTHORITY. Fax, National Guard Bureau (NGB) Region North Industrial Hygiene Office. (NGB-AVS-SI-IH/Ms. [redacted]), 28 February 2003, subject: SAB

4. BACKGROUND INFORMATION.

a. Armory Mission. Light infantry battalion.

b. Facility Use by Children. The point of contact stated that the armory periodically sponsors family support group activities and meals. The Maryland Military Department is currently advertising Dundalk Armory as available for rental for activities that include young children.

5. FACILITY EVALUATION.

a. Sampling Locations and Results. Samples were collected for lead in air, on surfaces (wipe samples), and in bulk paint to determine the presence of lead hazards. Sample locations are shown in Appendix B.

b. Physical Condition of Facility.

(1) General. There was deteriorated paint throughout the armory. Otherwise, the facility appeared to be in good physical condition. No mold or moisture source capable of supporting mold was observed.

Readiness thru Health

(2) Asbestos. At the time of the survey, the building was under contract to have all asbestos floor tiles replaced and to have the asbestos insulation on pipes removed. The building manager, MAJ [redacted], stated on 22 March 2005 that all known asbestos has been removed.

(3) Safety Hazards. Personnel conducting the survey reported that furniture and other equipment on the drill hall floor posed a potential tripping hazard. MAJ [redacted] stated on 22 March 2005 that all equipment had been removed from the drill hall.

c. Safety and Industrial Hygiene Programs. There were no written records for Safety or Industrial Hygiene programs, nor was there any documentation of program elements.

d. Heating, Ventilation, and Air Conditioning Systems. The building was centrally heated by steam baseboard radiators. Some areas of the building had central air conditioning, but most areas had window air conditioning units.

e. Lighting. All areas of the armory were judged to be adequately lit except for Room 102A, where lighting levels of 17-20 foot candles were measured.

f. Converted Indoor Firing Range (IFR). The IFR had been converted to a storage area.

g. Photographs. See Appendix C.

h. Survey Date. 23 July 2003.

6. ASSESSMENT CRITERIA FOR LEAD. See Appendix D for details.

a. Lead in Air. The army occupational exposure limit for lead in air is the Occupational Safety and Health Administration (OSHA) 8-hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter ($\mu g/m^3$) of air.

b. Lead in Dust. The Environmental Protection Agency (EPA) and State of Maryland limits for lead in dust are 40 micrograms per square foot ($\mu g/ft^2$) on floors, 250 $\mu g/ft^2$ on window sills, and 400 $\mu g/ft^2$ in window troughs. These limits apply to pre-1978 army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The NGB Region North concurs with the U.S. Army Center for Health Promotion and Preventive Medicine-recommended safe limit of 200 $\mu g/ft^2$ on floors and frequently-contacted surfaces.

c. Lead in Paint. Paint containing lead levels of 0.5% or more by weight in dried solid (also reported as 5000 milligrams per kilogram) is considered to be lead based paint according to both Federal and Maryland State Regulations. Paint containing lead levels of more than 0.7 milligrams per square centimeter is considered to be lead based paint according to Maryland

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State Regulations. In AR 420-70, Buildings and Structures, lead-contaminated paint is defined as any paint containing detectable amounts of lead. The army considers lead-contaminated paint to be potentially hazardous to children if it is disturbed or deteriorating.

d. Lead Carcinogenicity. The Department of Health and Human Services National Toxicology Program (NTP) released the Report on Carcinogens, Eleventh Edition in February 2005. The NTP report lists "lead and lead compounds" as "reasonably anticipated to be human carcinogens".

7. SAMPLING RESULTS FOR LEAD. See Appendix B.

a. Lead in Air. All air sample results were below the laboratory reporting limits for lead in air of 5.8-5.9 $\mu g/m^3$ and were therefore far below the army exposure limit.

b. Bulk Paint Samples. The two bulk samples of deteriorated paint had detectable levels of lead and were therefore lead-contaminated paint.

c. Lead in Dust. Four of the10 surface wipe results were above the recommended adult exposure limit. The highest measured result was 47,000 $\mu g/ft^2$ on the floor of the former IFR in the bullet trap area (photo #1355). A level of 973 $\mu g/ft^2$ was found on a baffle suspended from the ceiling in the former IFR (photos #1356-1358). Levels of 518 $\mu g/ft^2$ and 344 $\mu g/ft^2$ were found on the operations office window sill (photo #1364) and on a work table in the exercise area in the garage (photo #1360) respectively.

d. Child Exposure to Lead in Dust. Five of the 10 surface lead wipe results were above the EPA and State of Maryland exposure limits for children under the age of six.

8. DISCUSSION AND CONCLUSIONS.

a. Lead Exposure.

(1) Adults. No significant airborne exposures were measured. Lead levels in dust exceeded the recommended limit in several areas of the building. Higher results in the former IFR indicate that it was not properly decontaminated when it was converted to a storage area. Personnel working in the former IFR are exposed to lead on stored materials and track lead into other areas of the armory and into their own vehicles and homes. Lead-contaminated paint has begun to deteriorate and will continue to do so unless it is stabilized. Falling paint is likely to contribute to the levels of lead in dust. At a minimum, the former IFR should be properly decontaminated in accordance with NGB guidance, other rooms with excessive levels should be cleaned using appropriate techniques, and all deteriorated paint surfaces should be stabilized. In the meantime, personnel working in the former IFR should wear disposable garments to prevent them from tracking lead out, and this room should be locked and posted for access in

emergencies only. Compliance with OSHA lead regulations is required to protect personnel working in areas with elevated lead levels or repairing deteriorated lead-contaminated paint. A written Lead Hazard Management Plan should be developed and implemented to properly manage lead hazards and their sources until they are eliminated.

(2) Children. Lead in dust results from several areas in the armory greatly exceeded the regulatory limits for children under 6 years of age, and the two samples of deteriorated paint were found to be lead-contaminated paint. Lead is being tracked throughout the facility. Although children are unlikely to occupy this armory for more than the minimum 60 hours per year required for the regulatory limits to apply, we believe that these conditions pose a significant health hazard from lead exposure to children using this facility that warrants clean-up to these limits before allowing children to continue to use it.

b. Lighting. Lighting levels in Room 102 A should be increased to 28-46 foot candles to conform to the Illuminating Engineering Society of North America standard.

9. RECOMMENDATIONS.

The Department of Defense Instruction 6055.1 provides a method for assigning Risk Assessment Codes (RACs) to health hazards that are based on the magnitude of exposures to physical, chemical, and biological agents and the possible medical effects. A RAC is an expression of the risk associated with a hazard that combines the hazard severity and accident probability into a single numeral. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

a. Lead Exposure for Adults. RAC 3. Lead Exposure for Children. RAC 2.

(1) Develop and implement a written Lead Hazard Management Plan for Dundalk Armory. Ensure that the armory is in compliance with the Occupational Safety and Health Administration (OSHA) general industry lead standard, Title 29 Code of Federal Regulations, Parts1910.1025, and the OSHA Lead in Construction Standard, Title 29 CFR Part 1926.62.

(2) Address all potential lead hazards before continuing to extend the use of this facility to children. If children will continue to use this facility, clean surfaces to the EPA and State of Maryland lead in dust standards of 40 µg/ft² on floors and 250 µg/ft² on window sills. Discontinue advertising and hosting events that include children until cleanup is completed.

(3) Clean all areas where sampling results showed elevated levels of lead. At a minimum, if only adults use this facility, clean to the recommended safe levels for adults. Follow the comprehensive guidelines for cleaning in Appendix E. Follow the decontamination

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requirements for the IFR provided in the Addendum to NGB All States Letter P01-0075. Consult with the Maryland Armory Environmental Coordinator concerning disposal requirements after cleanup.

(4) Stabilize the deteriorated paint on the walls.

(5) Pending clean-up, restrict access to the former IFR by keeping it locked. Post a sign warning against use of the room except in an emergency. Ensure that personnel wear disposable gloves and disposable coveralls to prevent tracking lead out when working in the former IFR.

b. Lighting. RAC 5. Increase lighting levels in Room 102A to 28-46 foot candles.

10. SITE MAP. See Appendix F.

11. MOLD GUIDANCE. There was no visible mold present at the time of the survey. If mold occurs in the future, refer to the mold guidance in Appendix G.

12. ADDITIONAL ASSISTANCE. For additional assistance or questions concerning this report, please contact the undersigned at DSN 584-5475/3118, commercial (410) 436-5475/3118, or electronic mail: [redacted]@us.army.mil

[redacted]
Industrial Hygienist
USACHPPM Lead and Asbestos Team Leader
Industrial Hygiene Field Services Program

APPROVED:

[redacted]
Technical Manager
Industrial Hygiene Field Services Program

APPENDIX A

REFERENCES

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APPENDIX A

REFERENCES

1. Title 29, Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration, current edition.
http://www.osha.gov/comp-links.html

2. Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program, August 19, 1998.
http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf

3. AR 40-5, Medical Service, Preventive Medicine, 15 October 1990.
http://www.usapa.army.mil/pdffiles/r40_5.pdf

4. AR 385-10, The Army Safety Program, 29 February 2000.
http://www.usapa.army.mil/pdffiles/r385_10.pdf

5. DA PAM 40-503, Medical Services, Industrial Hygiene Program, 30 October 2000.
http://www.usapa.army.mil/pdffiles/p40_503.pdf

6. American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs), ACGIH Cincinnati, OH, 2005.
http://www.acgih.org/TLV/

7. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 62-2002, Ventilation for Acceptable Indoor Air Quality.

8. Illuminating Engineering (February 1, 1993) RP-1-1993, American National Standard Practice for Office Lighting, ANSI/IES RP-1-1993.

9. USACHPPM Interim Report No. 39-EJ-1157-99, Derivation of Wipe Surface Screening Levels for Environmental Chemicals, 1999.

10. OSHA Instruction, CPL 02-02-058 - CPL 2-2.58 - 29 CFR 1926.62, Lead Exposure In Construction; Interim Final Rule-- Inspection and Compliance, Procedures, 1993.
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=1570

11. U.S. Department of Housing and Urban Development (HUD), Technical Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing 1998.
http://www.hud.gov/offices/lead/guidelines/hudguidelines/index.cfm

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APPENDIX B

SAMPLING SHEETS AND LAB ANALYSES

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Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211
(303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

August 15, 2003

Laboratory Code:	**RES**
Subcontract Number:	**NA**
Laboratory Report:	**RES 96014-1**
Project Description:	**None Given**
	Pikesville NG Armory

[redacted]
USACHPPM
USACHPM, ATTN: MCHB-TS-OFS Bldg 1570
APG MD 21010

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association, Lab ID 101533 - Accreditation Certificate #480. The laboratory is currently proficient in both PAT & ELPAT programs respectively.

Reservoirs has analyzed the following sample(s) using Atomic Emission Spectroscopy - Inductively Coupled Plasma (AES-ICP) per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the analysis table. Results have been sent to your office.

RES 96014-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you should have any questions about this report, please feel free to call me at 303-964-1986.

Sincerely,

[redacted]

President

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD IN PAINT

RES Job Number:	**RES 96060-1**
Client:	**Army National Guard IH – West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**None Given**
Date Samples Received:	**July 30, 2003**
Analysis Type:	**USEPA SW846 3050B / AA (7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**July 31, 2003**

Client ID Number	Lab ID Number	Detection Limit (%)	LEAD CONCENTRATION (%)
PI BULK 01	EM 800569	0.005	0.149
PI BULK 02	EM 800570	0.005	0.396
PI BULK 03	EM 800571	0.005	0.863
PI BULK 04	EM 800572	0.005	0.139
PI BULK 05	EM 800573	0.005	0.067
PI BULK 06	EM 800574	0.005	0.120
PI BULK 07	EM 800575	0.005	0.110
PI BULK 08	EM 800576	0.005	0.259
PI BULK 09	EM 800577	0.005	0.058
PI BULK 010	EM 800578	0.005	0.008
DK BULK 01	EM 800579	0.005	0.136
DK BULK 02	EM 800580	0.005	0.014
CA BULK 01	EM 800581	0.005	0.345
CA BULK 02	EM 800582	0.005	0.118
CA BULK 03	EM 800583	0.005	0.037
CA BULK 04	EM 800584	0.005	0.154
CA BULK 05	EM 800585	0.005	0.034
CA BULK 06	EM 800586	0.005	0.005

BDL = Below Detection Limit

Data QA ______

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD IN AIR

RES Job Number:	**RES 96012-1**
Client:	**USACHPPM**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**Dun Daik NG Armory**
Date Samples Received:	**July 29, 2003**
Analysis Type:	**NIOSH AA(7082)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**July 30, 2003**

Client ID Number	Lab ID Number	Air Volume (L)	LEAD (µg)	Detection Limit (µg/m³)	LEAD CONCENTRATION (µg/m³)
DKAS-01	EM 799976	428	BDL	5.8	BDL
DKAS-02	EM 799977	428	BDL	5.8	BDL
DKAS-03	EM 799978	426	BDL	5.9	BDL
DKPb-Blank01	EM 799979	0	BDL	----	----
DKPb-Blank02	EM 799980	0	BDL	----	---

BDL = Below Detection Limit

Data Qa

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD IN PAINT

RES Job Number:	**RES 96060-1**
Client:	**Army National Guard IH - West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**None Given**
Date Samples Received:	**July 30, 2003**
Analysis Type:	**USEPA SW846 3050B / AA (7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**July 31, 2003**

Client ID Number	Lab ID Number	Detection Limit (%)	LEAD CONCENTRATION (%)
PI BULK 01	EM 800569	0.005	0.149
PI BULK 02	EM 800570	0.005	0.396
PI BULK 03	EM 800571	0.005	0.863
PI BULK 04	EM 800572	0.005	0.139
PI BULK 05	EM 800573	0.005	0.067
PI BULK 06	EM 800574	0.005	0.120
PI BULK 07	EM 800575	0.005	0.110
PI BULK 08	EM 800576	0.005	0.259
PI BULK 09	EM 800577	0.005	0.058
PI BULK 010	EM 800578	0.005	0.008
DK BULK 01	EM 800579	0.005	0.136
DK BULK 02	EM 800580	0.005	0.014
CA BULK 01	EM 800581	0.005	0.345
CA BULK 02	EM 800582	0.005	0.118
CA BULK 03	EM 800583	0.005	0.037
CA BULK 04	EM 800584	0.005	0.154
CA BULK 05	EM 800585	0.005	0.034
CA BULK 06	EM 800586	0.005	0.005

BDL – Below Detection Limit

Data Qa

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD IN AIR

RES Job Number:	**RES 96012-1**
Client:	**USACHPPM**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**Dun Daik NG Armory**
Date Samples Received:	**July 29, 2003**
Analysis Type:	**NIOSH AA(7082)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**July 30, 2003**

Client ID Number	Lab ID Number	Air Volume (L)	LEAD (µg)	Detection Limit (µg/m^3)	LEAD CONCENTRATION (µg/m^3)
DKAS-01	EM 799976	428	BDL	5.8	BDL
DKAS-02	EM 799977	428	BDL	5.8	BDL
DKAS-03	EM 799978	426	BDL	5.9	BDL
DKPb-Blank01	EM 799979	0	BDL	---	---
DKPb-Blank02	EM 799980	0	BDL	---	---

BDL = Below Detection Limit

Data Qa ________

Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211
(303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

August 8, 2003

Laboratory Code:	**RES**
Subcontract Number:	**NA**
Laboratory Report:	**RES 96061-1**
Project Description:	**None Given**
	None Given

[redacted]
Army National Guard IH - West
3401 Quebec Street, Suite 7200
Denver CO 80207

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association, Lab ID 101533 - Accreditation Certificate #480. The laboratory is currently proficient in both PAT & ELPAT programs respectively.

Reservoirs has analyzed the following sample(s) using Atomic Emission Spectroscopy - Inductively Coupled Plasma (AES-ICP) per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the analysis table. Results have been sent to your office.

RES 96061-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you should have any questions about this report, please feel free to call me at 303-964-1986.

Sincerely,

[redacted]

President

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD BY WIPE SAMPLING

RES Job Number:	**RES 96061-1**
Client:	**Army National Guard IH - West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**None Given**
Date Samples Received:	**July 30, 2003**
Analysis Type:	**USEPA SW846 3050B / AA(7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 4, 2003**

Client ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
PI Blank 1	EM 800587	0.11	BDL	23	BDL
PI Blank 2	EM 800588	0.11	BDL	23	BDL
PI Blank 3	EM 800589	0.11	BDL	23	BDL
PI Blank 4	EM 800590	0.11	BDL	23	BDL
PI W16	EM 800591	0.11	22.8	23	207
PI W17	EM 800592	0.11	14.2	23	129
PI W18	EM 800593	0.11	56.2	23	511
PI W19	EM 800594	0.11	26.2	23	238
PI W20	EM 800595	0.11	10.1	23	92
PI W21	EM 800596	0.11	BDL	23	BDL
PI W22	EM 800597	0.11	BDL	23	BDL
PI W23	EM 800598	0.11	BDL	23	BDL
PI W24	EM 800599	0.11	BDL	23	BDL
PI W25	EM 800600	0.11	BDL	23	BDL
PI Blank 5	EM 800601	0.11	BDL	23	BDL
PI Blank 6	EM 800602	0.11	BDL	23	BDL
DK Blank 01	EM 800603	0.11	BDL	23	BDL
DK W01	EM 800604	0.11	BDL	23	BDL
DK W02	EM 800605	0.11	BDL	23	BDL
DK W03	EM 800606	0.11	BDL	23	BDL
DK W04	EM 800607	0.11	BDL	23	BDL
DK W05	EM 800608	0.11	5200.0	23	47273
DK W06	EM 800609	0.11	107.0	23	973
DK W07	EM 800610	0.11	37.8	23	344
DK W08	EM 800611	0.11	BDL	23	BDL
DK W09	EM 800612	0.11	7.2	23	65
DK W10	EM 800613	0.11	57.0	23	518
DK Blank 02	EM 800614	0.11	BDL	23	BDL
DK W11	EM 800615			Sample not submitted	
DK Blank 03	EM 800616	0.11	BDL	23	BDL

BDL Below Detection Limit

Data Qa

APPENDIX C

PHOTOGRAPHS

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Dundalk Armory Locations of Lead Paint and Surface Wipe Samples

Photo Number	Location of Samples
1350	Lead Wipe Sample/Top of refrigerator in kitchen area
1351	Lead Wipe Sample/Horizontal wall near refrigerator and window in kitchen
1352	Bulk Paint Sample/Supply Room/recently renovated, painted roof
1353	Lead Wipe Sample/HHC orderly office on floor under window
1354	Lead Wipe Sample/Anti-armor Platoon office walls and floors being renovated
1355	Lead Wipe Sample/Storage Room/former IFR Bullet Trap area /renovated and being used for storage
1356	Lead Wipe Sample/former IFR near light pointed toward bullet trap
1357	Lead Wipe Sample/Storage Room (former IFR) near light pointed toward bullet trap
1358	Lead Wipe Sample/Storage Room (former IFR) near light pointed toward bullet trap
1359	Bulk Paint Sample/wall near entrance to former IFR
1360	Lead Wipe Sample/Worktable in garage/workout area with equipment
1361	Lead Wipe Sample/Mail Room/Personnel office/floor under window
1362	Lead Wipe Sample/On top locker in one room of Mail Room/Personnel office
1363	Lead Wipe Sample/On top locker in one room of Mail Room/Personnel office
1364	Lead Wipe Sample/Operations office window sill

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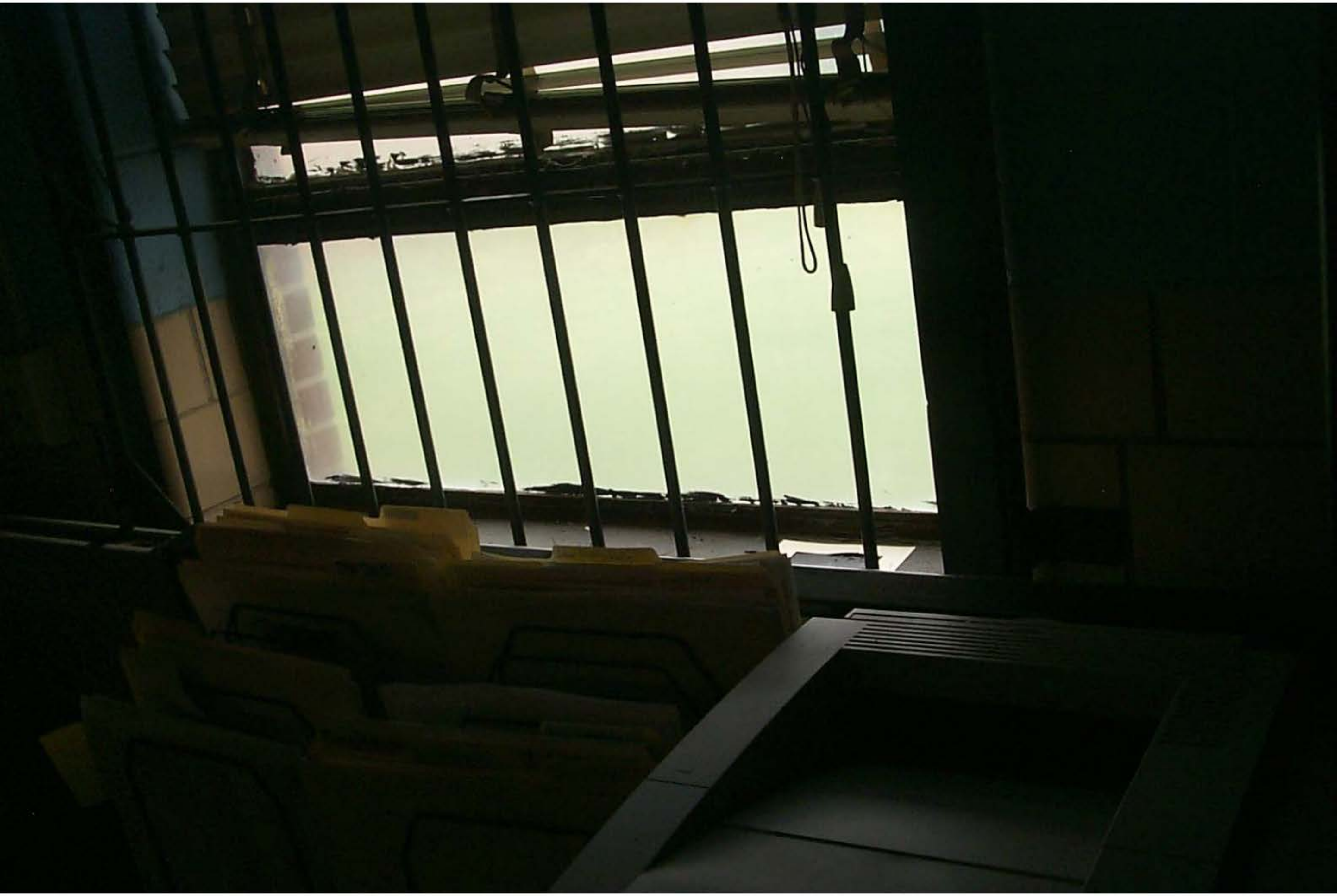

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APPENDIX D

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE

ASSESSMENT CRITERIA FOR LEAD

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SUBJECT: National Guard Bureau Region North Industrial Hygiene Office
Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 $\mu g/ft^2$. This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. The EPA standards (40 CFR 745.227(e) (8) (viii)) and State of Maryland standards are not directly applicable because they are developed for floors (40 $\mu g/ft^2$), windowsills (250 $\mu g/ft^2$)and window troughs (400 $\mu g/ft^2$) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. The OSHA has no specific requirement for work area surfaces. The OSHA lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. The OSHA cites a level of 200 $\mu g/ft^2$ in OSHA Instruction CPL 2-2.58 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 $\mu g/ft^2$ is a safe surface contamination level for adult exposures. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels higher than those recommended above do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All States will receive this guidance when it is completed.

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 50 $\mu g/m^3$ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

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APPENDIX E

LEAD CLEANING GUIDANCE

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CHAPTER 14: CLEANING

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
3. Have sufficient cleaning equipment and supplies *before* beginning work.
4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
13. Paint or otherwise seal treated surfaces and interior floors.
14. Conduct a clearance examination (see Chapter 15).
15. If clearance is not achieved, repeat the final cleaning.

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16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.

17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.

18. Cleaning equipment list:

    - HEPA vacuums.
    - Detergent.
    - Waterproof gloves.
    - Rags.
    - Sponges.
    - Mops.
    - Buckets.
    - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
    - 6-mil plastic bags.
    - Debris containers.
    - Waste water containers.
    - Shovels.
    - Rakes.
    - Water-misting sprayers.
    - 6-mil polyethylene sheeting (or equivalent).

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Chapter 14: Cleaning

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris *and* dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?
- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards *and* were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

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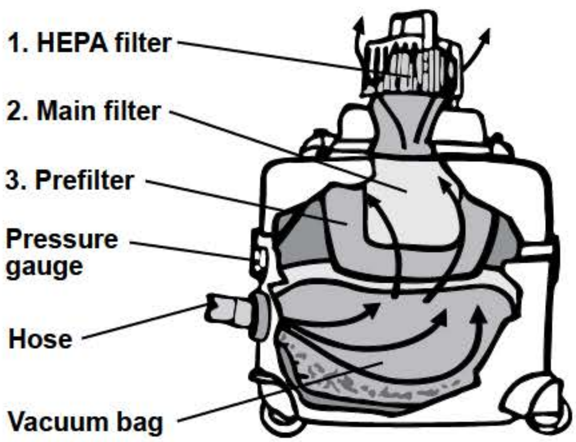
Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and pre-filter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the pre-filter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

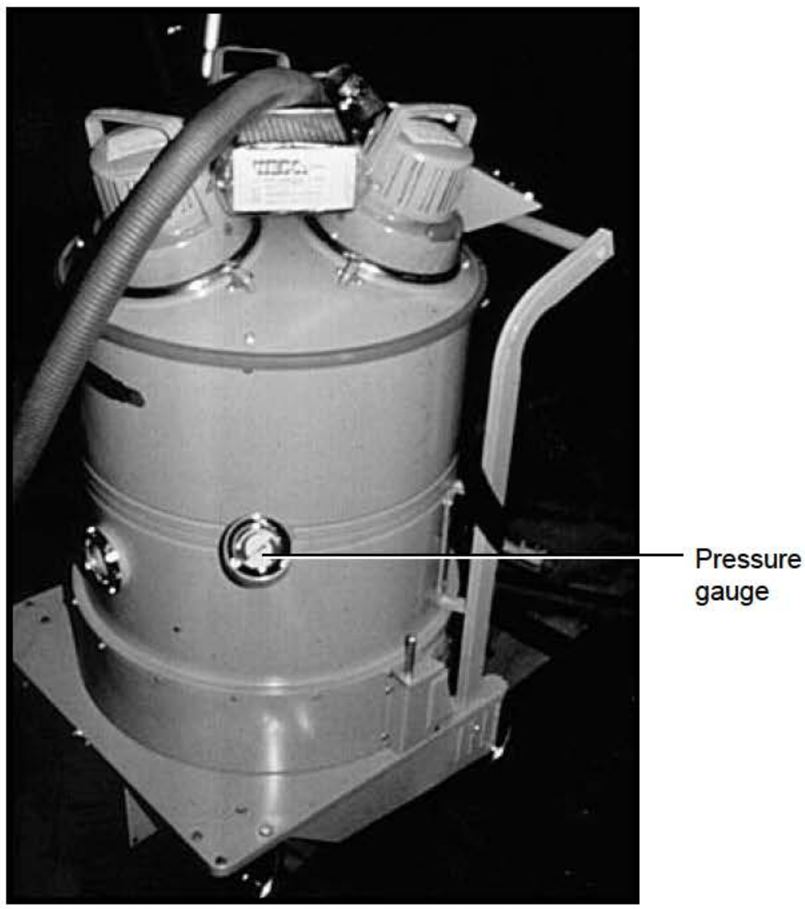
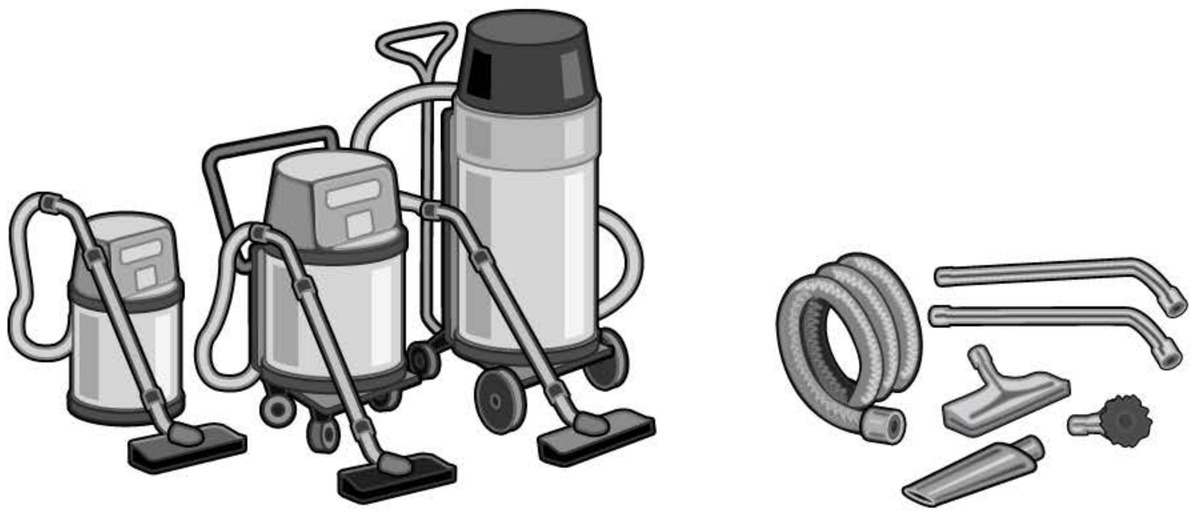


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

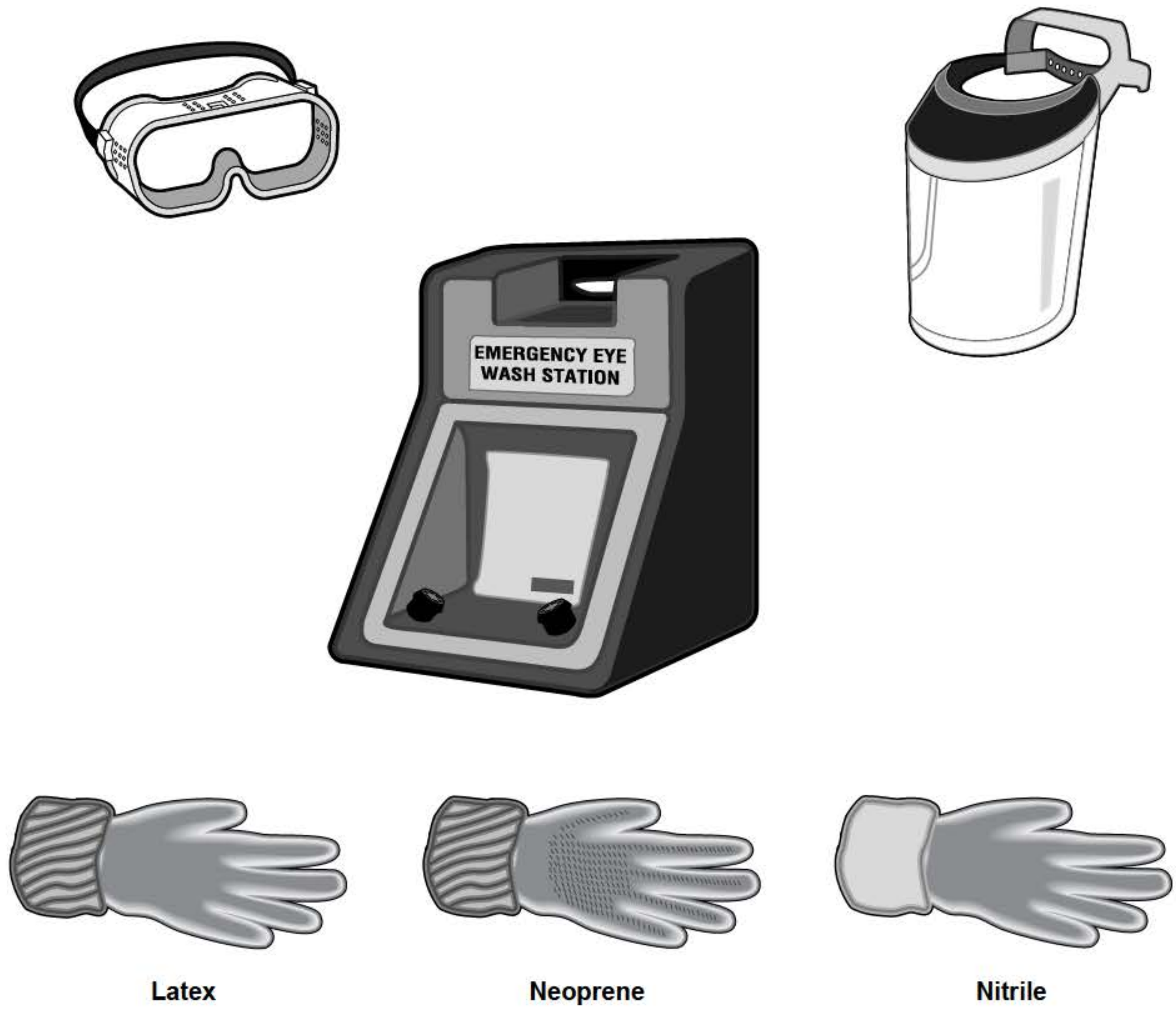
Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

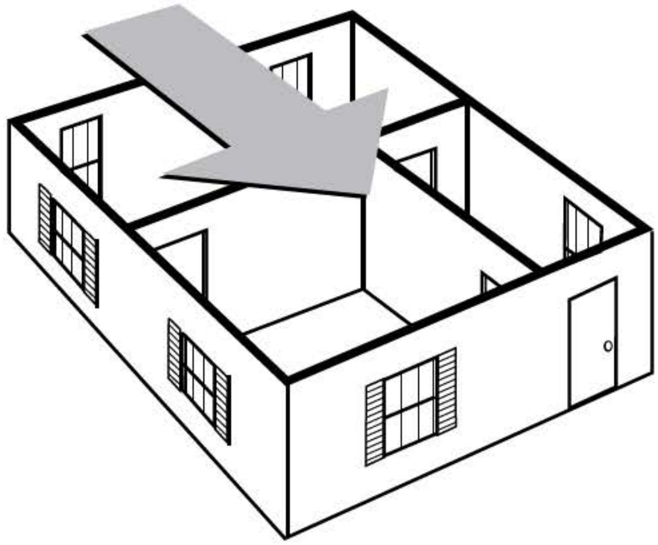
Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

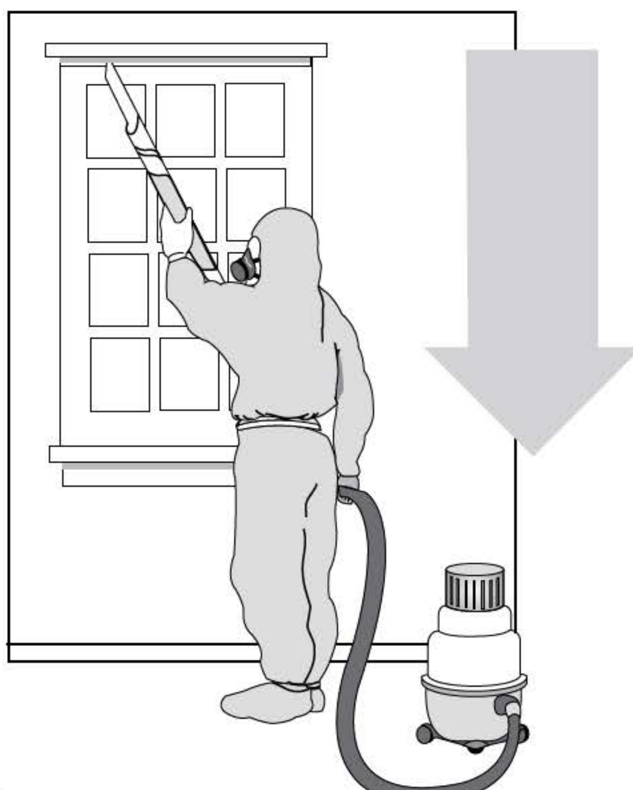
- First, the area is HEPA vacuumed.

Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on, and work down to the floor. Do every inch of the windows, especially the window troughs.



Courtesy: Alice Hamilton Occupational Health Center

- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.

Rubber Cone

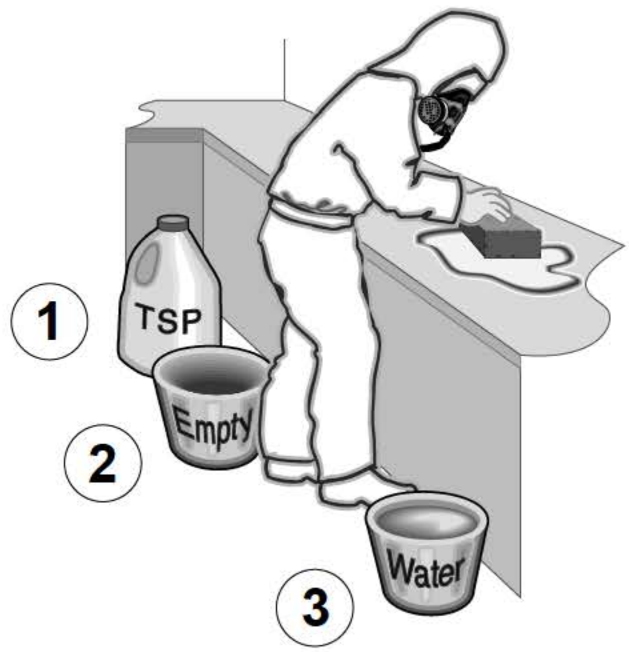
Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

Figure 14.4c (continued)

Wash all surfaces with suitable detergents
Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces

Wet Mop Floor

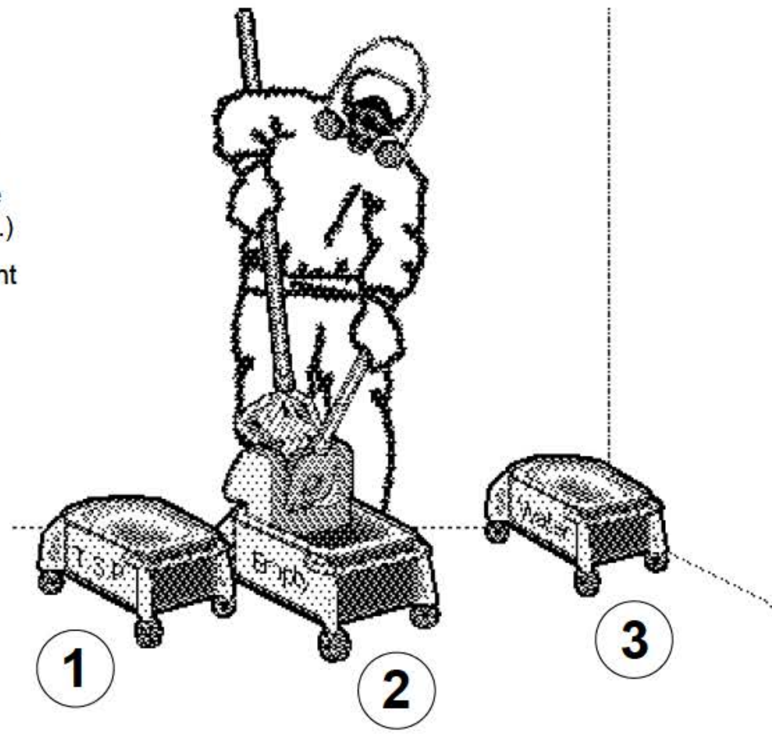
Don't Dry Sweep

Figure 14.4c (continued)

Use the 3-Bucket System.

To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.



Squeeze out the mophead in empty bucket #2. Return to bucket #1 for more detergent solution and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

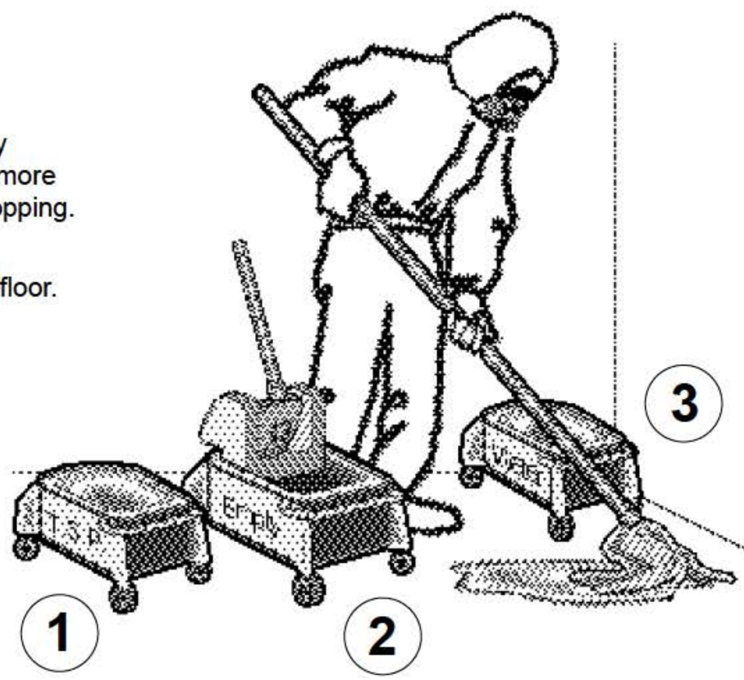


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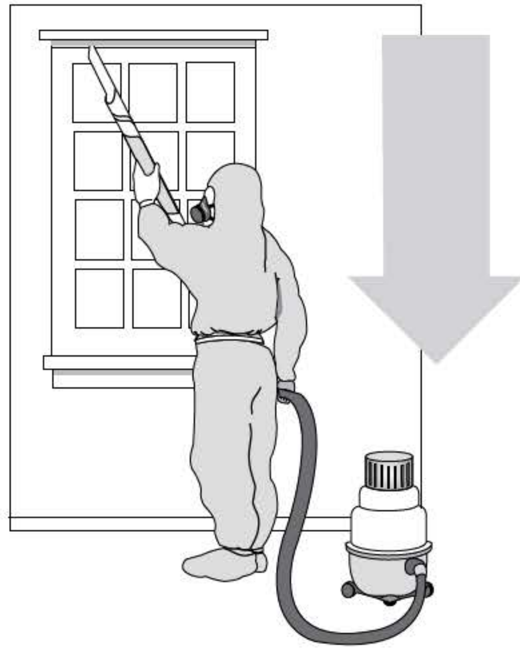
Figure 14.4d (continued)

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.

Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water *and cleaned.* All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).