Page 1 of 2

OWI (410) 247-2024

Potosed 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

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4. Comments:

Appendix B Photographs



Exterior sign



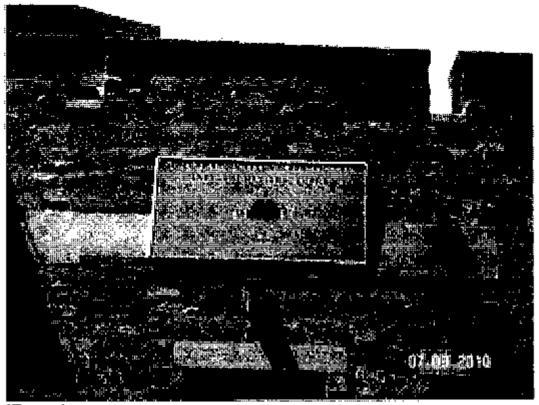
Exterior sign



Administration building, exterior



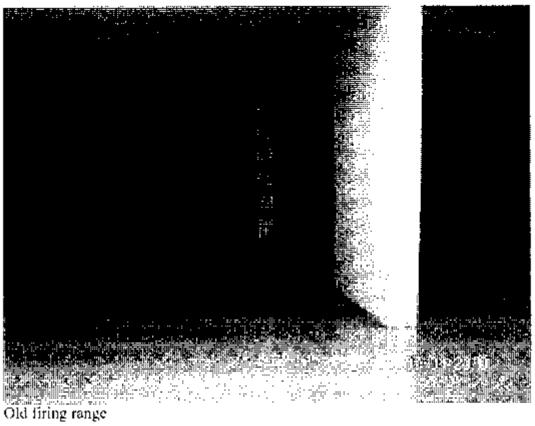
Darnaged ceiling, large training room



IT, exterior

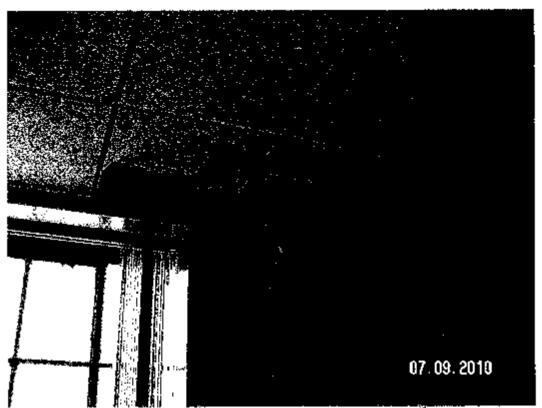


Armory, exterior

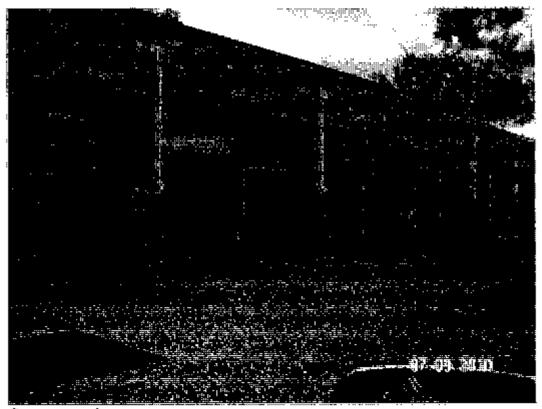




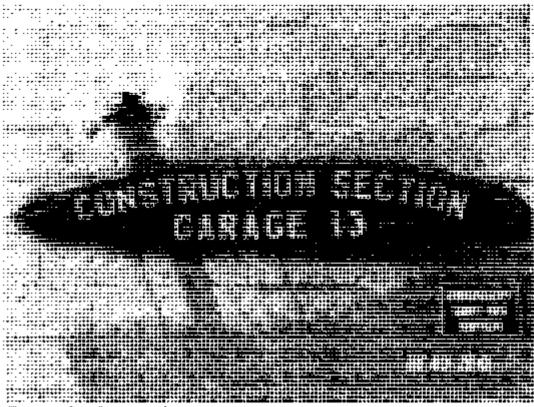
Damaged ceiling tiles and suspect ACM in Honor Guard area, 3rd floor



Damaged ceiling tiles and suspect ACM in Honor Guard area, 3rd floor



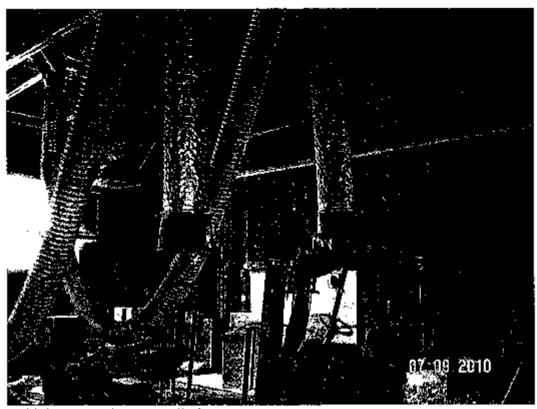
Garage, exterior



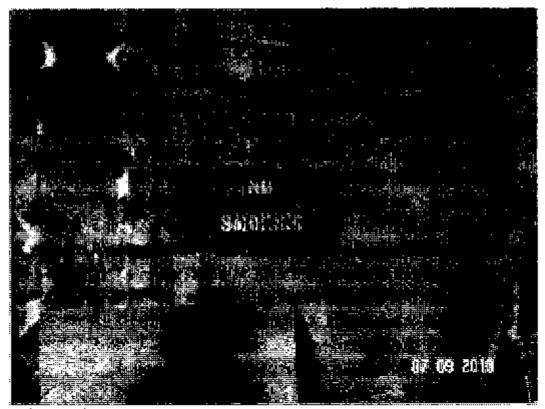
Construction shap, exterior



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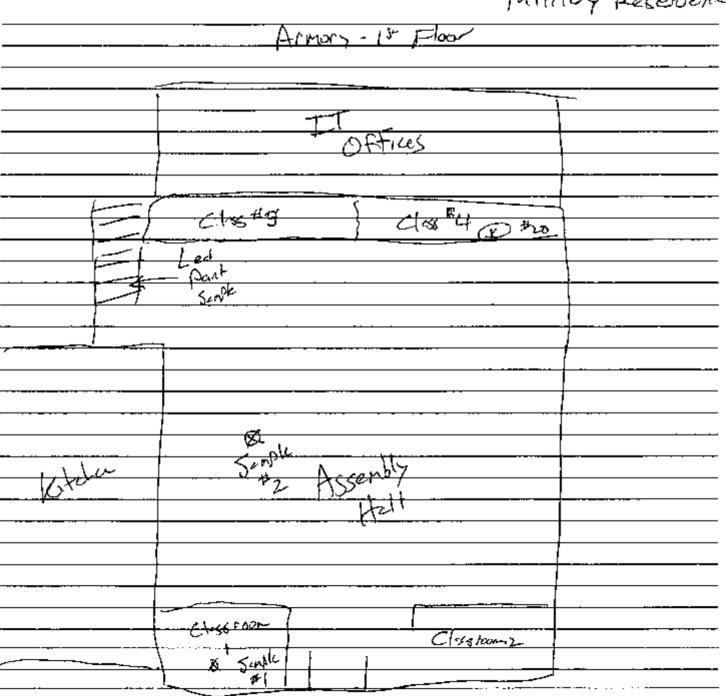
Appendix C Floor Plans

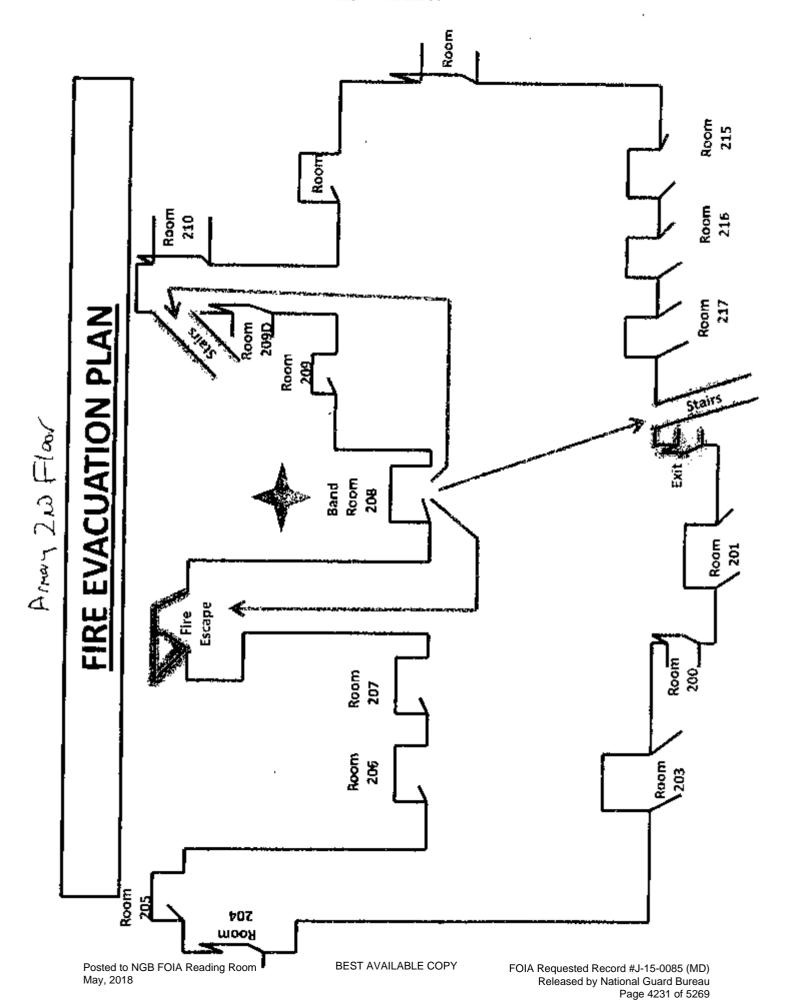
www.enalyticatiab.com

ALSI Daily Notes

Date: 7/9/10

Project Name: Dikesalle
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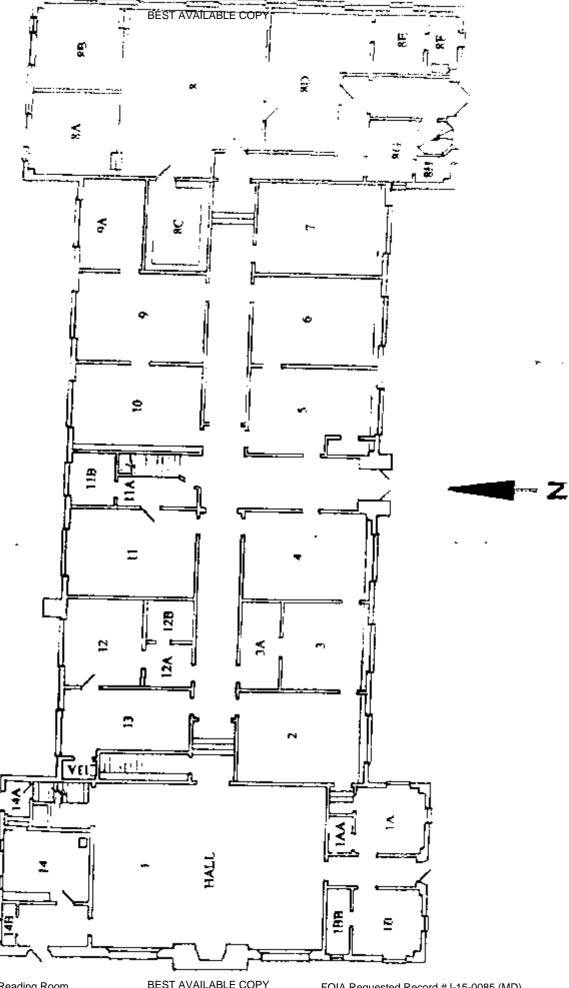


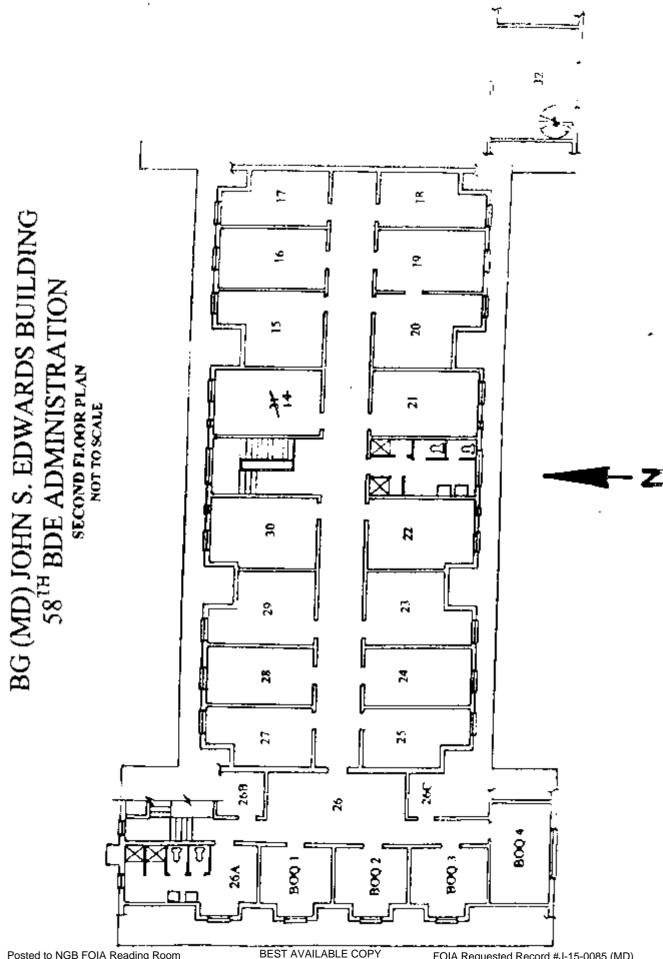
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ALSI Daily Notes

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BG (MD) JOHN S. EDWARDS BUILDING 58TH BDE ADMINISTRATION FIRST FLOOR PLAN NOT TO SCALE





Posted to NGB FOIA Reading Room May, 2018

FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 4234 of 5269

BEST AVAILABLE COPY **B**3B BG (MD) JOHN S. EDWARDS BUILDING 58TH BDE ADMINISTRATION KHCHEN BASEMENT FLOOR PLAN NOT TO SCALE B24 OFFICERS CLUB **B**5 A18 818 BOILER ROOM Ā Posted to NGB FOIA Reading Room May, 2018 BEST AVAILABLE COPY FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau

Page 4235 of 5269

Appendix D References

Appendix D. Reforences

- 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 (ACGIII) Threshold Limit Values and Biological Exposure Indices, 2010 Edition
- 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
- 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)
- The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation



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 Pikesville Readiness Center

Prepared For: National Guard Bureau Region North IH

301-IH Old Bay Lane

Havre de Grace, MD 21078

Survey Location: Pikesville Readiness Center

610 Reisterstown Road Pikesville, MD 21208

Prepared By: Compliance Management International, Inc.

1215 Manor Drive

Suite 205

Mechanicsburg, PA 17055

Survey Date: July 2, 2013

Report Date: July 31, 2013



Manager, Industrial Hygiene Services

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Table of Contents

Section 1.0 Executive Summary	3
Section 2.0 Operation Description & Observations	4
Section 3.0 Lead Testing	5
Section 4.0 Lighting	7
Section 5.0 Indoor Air Quality	8
Section 6.0 Suspect Asbestos Containing Building Materials	10
Section 7.0 Equipment	11
Section 8.0 Limitations	12
Appendix A. Laboratory Analysis Report	13
Appendix B. Photographs	14
Appendix C. Floor Plan	15
Appendix D. References	16

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on July 2, 2013, at the Pikesville Readiness Center located at 610 Reisterstown Road, Pikesville, MD 21208. The survey was performed by Mr. Non-Responsive

- 1. Surface samples for lead exceeded the NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges recommended guideline in several locations. Peeling paint was observed in two locations. 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 exceeded the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in the drill hall.
 - 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 the drill hall.
 - 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 (CO₂) 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) were found to be intact and in good condition.

Section 2.0 Operation Description & Observations

The Pikesville Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, and a converted firing range area (currently storage room). There were approximately 20 full-time employees stationed at this facility at the time of this survey.

The building is reported to be over 100 years old. Most of the second floor is occupied by the Maryland Defense Force and was not surveyed. This facility has 30 old stables that are now used as storage areas. Most of the stables/storage areas were locked. It was reported that only a few stables have lighting and none of the stables have HVAC systems. Overall access for CMI personnel at this facility was limited.

The exterior is stone. The interior walls are block, plaster, and drywall. The floors are concrete and 12"x12" floor tile.

The heating system consists of a gas-fired steam unit. There is no central A/C system. There are some window air conditioners on the third floor.

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 as storage. It was reported that the range has been abated two times.

Housekeeping practices were good.

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	Surface
#	Location	(%)	ug/m ³	ug/ft ²
1	Drill Hall	*	<6.7	*
2	Converted Firing Range	*	<6.7	*
3	Drill Hall – Floor	*	*	<110
4	Drill Hall – Top of Bleachers	*	*	160
5	Drill Hall – Top of Electrical Box	*	*	1,800
6	Kitchen – Top of Ice Machine	*	*	<110
7	Kitchen – Top of Food Mixer	*	*	<110
8	Hallway – Outside of Firing Range	*	*	<110
9	Converted Firing Range – Floor	*	*	750
10	Converted Firing Range – Top of	*	*	170
10	Wall Locker			170
11	Converted Firing Range – Window	*	*	300
	Sill			300
12	Room 103 – Desk	*	*	<110
13	Room 102 – Desk	*	*	<110
14	Supply Wall Locker Storage Area –	*	*	710
14	Top of Wall Locker			710
15	Room 304 – Top of File Cabinet	*	*	<110
16	Blank – Wipe	*	*	<12 ug
17	Blank – Air		<3 ug	*
19	Stairway 1 st to 2 nd Floor	0.34	*	*
20	Stairway 2 nd Floor	0.58	*	*
-	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. $\mathbf{ug/m}^3 = \text{micrograms per cubic meter}$
- 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/ft²) 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/ft² on floors and 250 ug/ft² on windowsills should be observed. There is no child care provided at this facility.

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

- Surface levels of lead were above the recommended guideline of 200 ug/ft² in the following locations:
 - o Drill hall top of electrical box
 - o Converted firing range floor
 - o Converted firing range window sill
 - o Supply wall locker storage area top of wall locker

Cleaning and housekeeping should be improved in any location where lead was identified in surface samples above the 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/m³).
- One of the two paint chip samples analyzed met the EPA/HUD definition of lead-based paint. All areas of damaged and peeling paint should be repaired and repainted using methods to control dust (e.g., wet methods) by properly trained and protected workers.

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	25.2	10	Yes
Room 103 Classroom 3	66.1	30-50	Yes
Room 104 Classroom 4	71.3	30-50	Yes
Kitchen	102.1	50	Yes
Room 102 Classroom 2	97.1	30-50	Yes
Room 101 Classroom 1	132.4	30-50	Yes
Converted Firing			Yes
Range/Storage	81.9	30	
Honor Guard Office	143.1	30-50	Yes
Weight Room	152.8	30	Yes
Supply Wall Locker Storage	135.8	30	Yes
Stable/Storage Area	23.1	10	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 measured met the minimum recommended guideline.

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 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 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)
Honor Guard Office	76.6	45.0	557	0.0
Drill Hall	81.7	69.3	331	0.0
Outdoors	81.1	71.8	354	0.0
Criteria	68-79	30-60	<1,054	<9

Table Notes:

- 1. **Bolded** results exceed listed criteria
- 2. **ppm** = parts per million
- 3. (%) = percent relative humidity
- 4. ${}^{\circ}\mathbf{F} = \text{degrees Fahrenheit}$

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 were above the recommended guideline of 68-79°F in the drill hall. For comfort, maintain temperature between 68-79 degrees F during occupied periods.
- Relative humidity levels were about the recommended guideline of 30-60% in the drill hall. Maintain humidity levels between 30-60 percent.
- 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. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,054 ppm in sampled areas. This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm in sampled areas. 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. No significant concerns were noted or reported during this survey.

Section 6.0 Suspect Asbestos Containing Building Materials

The following suspect ACM was noted at the time of this survey:

- 1. Window glazing in the third floor weight room was sampled and analyzed for asbestos content. No asbestos was identified in this sample. See enclosed Laboratory Analysis Report in Appendix A.
- 2. Pipe insulation and mudded joint fittings were observed to be present throughout the facility. These materials were found to be intact and in good condition.

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	02041015	8/2012	NA
Cal Light 400 Light Meter	98011EL	11/2012	NA
SKC Air Sampling Pump	798129	7/2/13	2.5 LPM
SKC Air Sampling Pump	767926	7/2/13	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

AMA Analytical Services, Inc.

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CERTIFICATE OF ANALYSIS



LAB #100470

Client:

National Guard Bureau

Job Name:

ARNG MD

Chain Of Custody:

516266

Address:

301-IH Old Bay Lane, Attn: ARNG-CJG-P,

Job Location: State Military Reservation

Pikesville, RC

Date Submitted:

7/9/2013

Havre de Grace, Maryland 21078

Job Number:

Not Provided

Person Submitting:

P.O. Number:

W912K6-09-A-0003

Date Analyzed:

7/16/2013

Report Date: 7/16/2013

Attention:

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)		orting imit	Total ug	Final Res	ult	Comments
13076003	1	Flame	Air	450	N/A	6.7	ug/m³	<3	<6.7	ug/m³	
13076004	2	Flame	Air	450	N/A	6.7	ug/m³	<3	<6.7	ug/m³	
13076005	3	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13076006	4	Flame	Wipe	****	0.108	110	ug/ft²	17	160	ug/ft²	
13076007	5	Flame	Wipe	****	0.108	110	ug/ft²	200	1800	ug/ft²	
13076008	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13076009	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13076010	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13076011	9	Flame	Wipe	****	0.108	110	ug/ft²	80	750	ug/ft²	
13076012	10	Flame	Wipe	***	0.108	110	ug/ft²	18	170	ug/fl²	
13076013	11	Flame	Wipe	***	0.108	110	ug/ft²	33	300	ug/ft²	
13076014	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13076015	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13076016	14	Flame	Wipe	****	0.108	110	ug/ft²	77	710	ug/ft²	
13076017	15	Flame	Wipe	****	0.108	110	ug/fl2	<12	<110	ug/ft²	
13076018	16	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13076019	17	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13076020	19	Flame	Paint Chip	****	N/A	0.01	%Pb		0.34	%Pb	
13076021	20	Flame	Paint Chip	****	N/A	0.0095	%Pb		0.58	%Pb	

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. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AlHA, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

FOIA Requested Record #J-15-0085 (MD)

AMA Analytical Services, Inc.

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CERTIFICATE OF ANALYSIS



071-001# BAJ

Client:

National Guard Bureau

Job Name:

ARNG MD

Chain Of Custody:

516266

Address:

301-IH Old Bay Lane, Attn: ARNG-CJG-P,

Job Location:

Pikesville, RC

Date Submitted:

7/9/2013

State Military Reservation

Job Number:

Not Provided

W912K6-09-A-0003

Person Submitting:

Havre de Grace, Maryland 21078

P.O. Number:

Date Analyzed:

7/16/2013

7/16/2013

Attention:

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample

Client Sample

Analysis Type

Sample Type

Air Volume (L)

Area Wiped

Reporting Limit

Total ug

associated with these

Final Result

See QC Summary for analytical results of quality control samples

Comments

Number

Number

(ft2)

samples.

Report Date:

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

ug = micrograms

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/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.

Posted to NGB FOIA Reading Room

Nida McGarvey / Kim Shipe

Technical Manager:

G Edward Carney

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CHAIN OF CUSTODY

(Please Refer To Thi Number For Inquires

516266

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Page 4253 of 5269

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2. Address 1: 301							No. of Street,			FIRS			-12		O. #:W912K6-09-A-0003
3. Address 2: Attn:							3. Joi	D #:		Mar		001	-	P.O	10분
	re de Grace, Marylan						4. Co	ntact P	erson	Nor	1-K	esp	on	SIV	e phone # (410) 942-0273 Non-Responsive
5. Phone #:(410) 94	12-0273	Fax #	:_(410)	942-0254	2.0		5. Su	umitte	a by:L						mature: Mon-Responsive
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O Grav Reduction EL	08.1(QTY) .AP 198.6	(OTY)		□ EPA	100.1	2111100	_(QT	Y)							fedia
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MISC Vermiculite				(TEM V	Vater san	ples	°C)					1	Surfa	ce Tap	e(QTY)
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	SAMPBEINFORMAT					ANAD	YSIS)	. 0		, &,	MAT	RIX	. I m	, 4	CLIENT CONTACT
CLIENT ID	SAMPLE LOCATION/	DATE	VOLUME (LITERS)	WIPE AREA		5/3	1 8	100	18	BULK	32	See See	3 8	N. KA	(LABORATORY STAFF ONLY)
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4. Comments:

CHAIN OF CUSTODY

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Page 4254 of 5269

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hone #: (410) 942-0273 Fax #: (410) 942-0254										nature. Non-Respon	isive	11717
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Vermiculite (TEM Water s	amples	°C)								(QTY) Culturable II	O Species (Media	(Q
Asbestos Soil PLM_(Qual) PLM_(Quan) PLM/TEM_(Qual) PLM/TEM_(Quan)									pecity_)(QTY)		
SAMPLEINFORMATION	ANAD	rsis)	191	1 4	1 5	IATRI	X)	1 0	1 8	CLIENT	CONTACT	
CLIENT ID SAMPLE LOCATION VOLUME WIPE NUMBER IDENTIFICATION DATE (LITERS) AREA	8 3	13	MOLD	A 28	1 2	ATRI	SE SE	TAPE	SW	(LABORATORY	STAFF ONL	.Y)(Y)
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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS



Page 1 of 1

Client:

National Guard Bureau

Job Name:

ARNG MD

Chain Of Custody:

516266

Address:

301-IH Old Bay Lane, Attn: ARNG-CJG-P,

Havre de Grace, Maryland 21078

Job Location:

Pikesville, RC

Date Analyzed:

7/12/2013

State Military Reservation

Job Number:

P.O. Number:

Not Provided

Person Submitting:

Attention:

W912K6-09-A-0003

Summary of Polarized Light Microscopy

Client **AMA Sample** Mineral Fiberglass Organic Synthetic Other Particulate Sample Total Chrysotile Amosite Crocidolite Other Sample Homogeneity Analyst Comments Number Sample # Asbestos Percent Percent Percent Asbestos Wool Percent Percent Percent Percent Type Color ID Percent Percent 13076022 18 NAD 100 WG Homogeneous SW

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

- 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.
- 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)

Surat Watson

fs we

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CHAIN OF CUSTODY

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Mailing/Billing Information:	•	Submittal Info		G MU		
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3. Address 2: Altn: NGB-ARS-IHNE		3. Job#:	rso:Non-Res	enoneive	@ phone # (410) 942-0273	
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	ting information (Results	s will be provid	ed as soon as teening	any teasible):	REPORT TO:	···
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(ANDESTON ANTALYSIS)	TBM Bulk			Metales (malysis)	2 (QTY)	
PCM Air - Please Indicate Filter Type:	☐ ELAP 198.4/Chatfield	(Q	(TY)	D Ph Dust Wice (v	wipe type Clare) 19 (OTY)
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and the second second	TPM Duct			☐ Po Soil/Soild :		
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SAMPHEAN KORNAVION	WIPE / Z / Z /		Park Pa	25 17 8 MA		
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3. Results Reported To:	1-101-1-1-1-1-1	VIS:	121 A. Duig.	<u></u> /	F	age 4256 of 5269

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CHAIN OF CUSTODY

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Appendix B. Photographs



Exterior of the facility



Exterior old stables/storage areas



Inside view of a old stable/storage area



Inside one of the old stables/storage area suspect asbestos damaged transite board



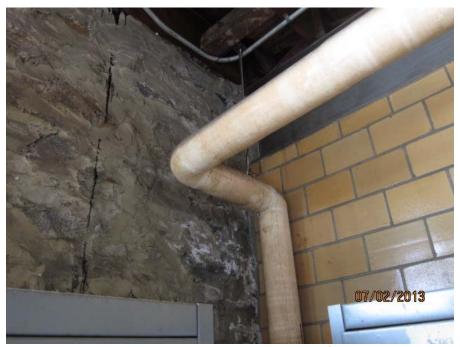
Drill Hall



Converted firing range/storage area



Suspect asbestos window glazing damaged and in poor condition in the weight room.



Suspect asbestos pipe insulation and mudded joint fittings in good condition located throughout the facility



Stairway from first to second floor peeling brown paint

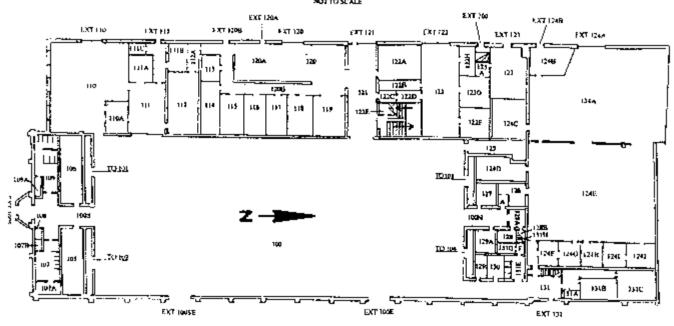


Stairway from second floor to exterior peeling blue paint

Appendix C. Floor Plan

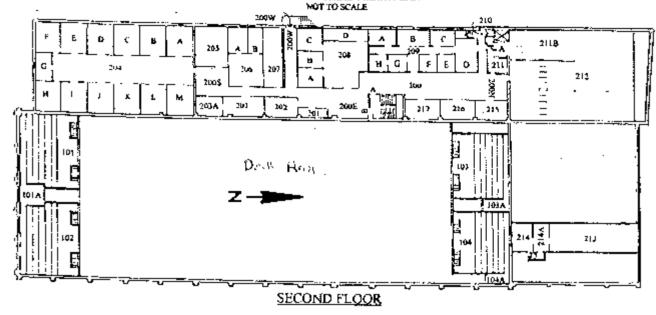
MG JOHN PURLEY COOPER, JR. BUILDING PIKESVILLE ARMORY

FIRST FLOOR PLAN



MG JOHN PURLEY COOPER, JR. BUILDING

PIKESVILLE ARMORY
SECOND AND THERD FLOOR PLAN
NOT TO SCALE



BEST AVAILABLE COLY FOIA Requested Record #J-15-0005 (MD)
THIRD FLAGUESSED by National Guard Bureau

Posted to NGB FOIA Reading Room May, 2018

Page 4265 of 5269

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 2004

MEMORANDUM FOR Army National Guard Bureau (NGB) Region North Industrial Hygiene NGB-AVS-SI-IH/Non-Responsive, 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. Prince Frederick Armory, Prince Frederick, MD

- 1. Enclosed is a copy of subject report and one CD-ROM.
- 2. Please direct any additional comments or concerns to Ms. at DSN 584-5475/3118, commercial (410) 436-5475/3118 or e-mail address at esponsive @apg.amedd.army.mil.

ENCL



Industrial Hygienist Industrial Hygiene Field Services Program

Readiness thru Health

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



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MDARNG FACILITIES IH BASELINE SURVEY
PRINCE FREDERICK ARMORY
PRINCE FREDERICK, MD
55-ML-01ED-03











Approved for public release; distribution unlimited.

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.



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) PRINCE FREDERICK ARMORY PRINCE FREDERICK, 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 armory meets the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) recommended guidelines for air quality for relative humidity and carbon dioxide levels. The indoor temperature of 80.5 degrees Fahrenheit exceeded the recommended ASHRAE guidelines. ASHRAE guidelines 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 399- 1074 parts per million (ppm). To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm, totaling approximately 1050 ppm of carbon dioxide.
- b. Building Issues. There is a leak in the roof with water damage in the second floor locker room and the renovated range area (rooms 1 and 4). The unit is in the process of getting bids to repair the roof.
- c. Lead. All air samples were below the laboratory analytical detection limit for lead in air of 3.0 to 15.0 $\mu g/m^3$. All samples were also below the Occupational Health and Safety Administration (OSHA) standard of 50 $\mu g/m^3$ lead in air. One dust-lead wipe sample result, located on the window sill of the former indoor firing range (IFR) Room # 3, exceeded the USACHPPM recommended decontamination level of 200 $\mu g/ft^2$ for dust-lead on frequently contacted surfaces. One surface dust-lead wipe result, taken from the vehicle maintenance shop bay floor, exceeded the EPA exposure standard of 40 $\mu g/ft^2$ for children for dust-lead on floors.
 - d. Asbestos. There are presumed asbestos floor tiles in the armory.

Readiness thru Health
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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 Indoor Air Quality. Thermal Environmental Conditions and Water Damage 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. The indoor temperature of 84.9 degrees Fahrenheit exceeded the ASHRAE recommended guidelines for an acceptable thermal environment.
- b. Building Issues. Repair the leaking roof. This has caused water damage in the second floor locker room and the renovated indoor firing range area (rooms 1 and 4). The unit is in the process of getting bids to repair the roof.
- c. Lead. The RAC for this armory for Lead Exposure is classified as 5. Clean all areas in and adjacent to the former firing range rooms where sampling results showed lead residue. 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. 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. Test drinking water from water fountains and faucets for lead. Address all potential lead hazards before extending this facility to use for children. If children continue to use this facility, clean surfaces to the EPA dust-lead standards for young children of $40 \mu g/ft^2$ on floors and $250\mu g/ft^2$ for dust-lead on window sills.
- d. Asbestos. The RAC for Asbestos Exposure is classified as 5. The presumed asbestos tiles are intact. If they become damaged in the future the asbestos tiles may become friable and asbestos fibers may be released. 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. Provide a HAZCOM and Respiratory Protection Program for the full time state workers who oversee the armory.

TABLE OF CONTENTS

Pa	uragraph	Page
1.	AUTHORITY	1
2.	PURPOSE OF EVALUATION	1
3.		
4.	SUMMARY OF ACTIONS	1
5.	ASSESSMENT CRITERIA FOR LEAD	
6.	SAMPLING RESULTS	3
7.		5
8.	RECOMMENDATIONS	6
9.	ADDITIONAL ASSISTANCE	6
En	nclosure	
1.	Lead Exposure	7
	Indoor Air Quality - Thermal Comfort	
	Indoor Air Quality – Water Damage	
	Asbestos Exposure	
	Additional Recommendations	
Ap	ppendices	
A.	- ASSESSMENT CRITERIA FOR LEAD	A-1
	- SITE MAPS	
	- PHOTOGRAPHS	
	- SAMPLING SHEETS AND LAB ANALYSES	
	- REFERENCES	
F.	- LEAD CLEANING GUIDANCE	.F-1
G.	- MOLD GUIDANCE	G-1



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 SEE DISTRIBUTION

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

LOCATION: Prince Frederick Armory, Prince Frederick, MD

- 1. AUTHORITY. E-Mail dated 28 February 2003 from Ms Non-Responsive, 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 121 Engineering Battalion, Company A.
 - b. Date of Construction. 1954
 - c. POC. SGM Non-Responsive (410) 974-7400 Cell; (443) 277-4923.
 - d. Date of Survey. 3 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 relative humidity measurements were collected to determine indoor air quality. Lighting conditions were measured. Sample results are in Appendix D.
 - b. Physical Condition of Facilities.
- (1) Paint. The paint condition is intact. Sergeant Non-Responsive, Environmental Compliance Assessment Coordinator for the MD NGB, stated that there are no records of lead-based paint abatement.

- (2) Asbestos. Staff Sergeant stated that there are no records of an asbestos abatement. The only potential asbestos containing building material identified is some 6 X 6 and 9 X 9 tile floor covering.
 - (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. However there is a leak in the roof with water damage in the second floor locker room and the renovated range area (rooms 1 and 4). The unit is in the process of getting bids to repair the roof.
- d. Safety and Industrial Hygiene Programs. There are no written program records at the armory. There is no Hazard Communication Program (HAZCOM) for the full time state workers who oversee the armory. They do have personal protective equipment (PPE) but no PPE program. They have material safety data sheets (MSDS) for the vehicle maintenance area of the facility.
- e. Heating, Ventilation, and Air-conditioning System. There is no central ventilation and HVAC system. Ventilation and air are 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. All Lighting was measured in twelve locations. Some measurements were taken with the lights off, because the rooms are normally used with the lights off. The list of locations measured and results are provided in Table 2, Appendix D.
- h. Converted indoor firing range (IFR). Staff Sergeant Non-Responsive, Environmental Compliance Assessment Coordinator for the MD NGB, stated that all lead was abated from the indoor firing range during its conversion. The IFR was converted to a distance-learning center. The range was divided into four rooms. The work has not been completed
 - i. Photographs (Appendix C).
 - j. Site Maps (Appendix B).
- k. Facility use by children. The POC stated that the armory is used extensively by the community and has wide-ranging use by children. Youth groups play basketball on the drill floor.

MDARNG Facilities IH Baseline Surveys, Prince Frederick Armory, Prince Frederick, MD Project No. 55-ML-01ED-03

- 5. ASSESSMENT CRITERIA FOR LEAD. (Appendix A).
- 6. SAMPLING RESULTS. Lead in air, surface dust-lead wipe, and indoor air quality sample results, as well as light measurements are shown in Appendix D. All air sample results were below the laboratory analytical detection limits of $3.0 \, \mu g/m^3$ and $15.0 \, \mu g/m^3$ lead in air, and the OSHA standard of $50 \, \mu g/m^3$ lead in air. One of 15 surface dust-lead wipes exceeded the USACHPPM recommended decontamination level of $200 \, \mu g/ft^2$ for floors and other frequently-contacted surfaces. One sample exceeded the EPA lead exposure levels for children of $40 \, \mu g/ft^2$ for floors.

The relative humidity was within the ASHRAE recommended range of 30 to 60%. The indoor temperature of 80.5 degrees Fahrenheit slightly exceeded the recommended ASHRAE guidelines for indoor air quality for an acceptable thermal environment.

The indoor carbon dioxide levels met the ASHRAE recommended guidelines. The carbon dioxide levels ranged from 399-1074 ppm. (See Table 1). To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. Therefore, the total carbon dioxide level should not exceed approximately 1050 ppm in this armory.

Table 1: Q-Trak Measurements for Indoor Air Quality

Location	Floor	Measurement
Lounge and Training Room	1st	1074 parts per million (ppm)
		CO_2
Drill Floor (area)	1st	399 ppm
Former Range Area new	1st	424 ppm
room # 1		
Former Range Area new	1st	409 ppm
room # 2		
Former Range Area new	1st	431 ppm
room # 3		
Former Range Area new	1st	472 ppm
room # 4		
Vehicle Maintenance	1st	615 ppm
Shop/Bay		
Kitchen	1 st	565 ppm
Utility Room	1st	444 ppm
First Sergeants Office (room	1st	506 ppm
#14)		
Commanders Office	1st	419 ppm
Recruiters Office	1st	724 ppm
Operations Office	1st	529 ppm
Supply	1st	541 ppm
Locker Room and Gym	2 nd	633 ppm
Platoon Room	2 nd	413 ppm
Common Room	2 nd	627 ppm
Outdoors		350 ppm

All areas of the armory appeared to be adequately lit and occupants reported no areas of deficient lighting. The lighting met the Illumination Engineering Society of North America Guidelines. A list of locations measured and results are provided in Table 2.

Table 2: Lighting Measurements

Location	Floor	Measurement	Guidelines
Lounge and Training Room	1st	19.3 Foot Candles (FC)	10-20 FC
Kitchen	1st	59.3 FC	
Vehicle Maintenance	1st	2.13 FC (no lights on)	20 FC
Shop/Bay			
Drill Floor (area)	1st	6 to 19 FC (no lights on)	10 FC
Former Range Area new	1st	68.4 FC	50-100 FC
room # 1			
Former Range Area new	1st	122 FC	50-100 FC
room # 2			
Former Range Area new	1st	478 FC	50-100 FC
room # 4			
First Sergeants Office	1st	38.4 FC	20-50 FC
(room #14)			
Operations Office	1st	86.0 FC	50-100 FC
Supply	1st	41.5 FC	20-50 FC
Locker Room and Gym	2 nd	15.6 FC	10 FC
Platoon Room	2 nd	15.6	10-20 FC

7. DISCUSSION AND CONCLUSIONS.

a. The armory relative humidity met the recommended ASHRAE guidelines for air quality. The indoor temperature of 80.5 degrees Fahrenheit exceeds the recommended ASHRAE guidelines. ASHRAE guidelines 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 met the ASHRAE recommended guidelines. The indoor carbon dioxide levels ranged from 399-1060 ppm. To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. Therefore the total carbon dioxide level should not exceed approximately 1050 ppm in this armory.

- b. There is a leak in the roof with water damage in the second floor locker room and the renovated range area (rooms 1 and 4). The unit is in the process of getting bids to repair the roof.
- c. All air samples are below the laboratory analytical detection limit for lead in air of 3.0 to 15.0 $\mu g/m^3$. This is also below the Occupational Health and Safety Administration (OSHA) standard of 50 $\mu g/m^3$ for lead in air. One dust-lead wipe sample result, located on the window sill of the former indoor firing range (IFR) Room # 3, exceeded the USACHPPM recommended decontamination level of 200 $\mu g/ft^2$ for dust-lead on frequently contacted surfaces.

One surface dust-lead wipe sample result exceeded the EPA lead exposure levels for children. The sample result was from the vehicle maintenance shop bay floor, and exceeded the EPA exposure standard of $40 \mu g/ft^2$ 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. Recleaning and sealing the distance learning center (former firing range rooms) room may further prevent exposures for children under six and for the general workforce.

- d. There are presumed asbestos floor tiles in the armory. The presumed asbestos tiles are intact. If they become damaged in the future, the asbestos tiles may become friable and asbestos fibers may be released.
- 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 Non-Responsive apg.amedd.army.mil.

Non-Responsive

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

PRINCE FREDERICK 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: Thermal Conditions and Water Damage is classified as 5. The RAC for Asbestos Exposure is classified as 5.

1. Lead Exposure. RAC 5.

- a. Clean all areas in and adjacent to the former indoor firing range rooms 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. Apply a sealant to the area. These actions should be accomplished before allowing children into the area.
- 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 $250\mu g/ft^2$ for dust-lead on window sills.

2. Indoor Air Quality. Thermal Comfort.

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 80.5 degrees Fahrenheit exceeds the ASHRAE recommended guidelines for an acceptable thermal environment. RAC 5.

3. Indoor Air Quality. Water Damage.

Repair the leaking roof. This has caused water damage in the second floor locker room and the renovated indoor firing range area (rooms 1 and 4). The unit is in the process of getting bids to repair the roof.

4. Asbestos Exposure.

The presumed asbestos tiles are intact. If they become damaged in the future the asbestos tiles may become friable and asbestos fibers may be released. 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. RAC 5.

5. Additional Recommendations. Provide a HAZCOM and Respiratory Protection Program for the full time state workers who oversee the armory.

MDARNG Facilities IH Baseline Surveys Prince Frederick Armory, Prince Frederick, 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 $200 \,\mu\text{g/ft}^2$. 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 μ g/ft²), windowsills (250 μ g/ft²) and window troughs (400 μ g/ft²) 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 μ g/ft² 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/m³ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

MDARNG Facilities IH Baseline Surveys Prince Frederick Armory, Prince Frederick, MD Project No. 55-ML-01ED-03

APPENDIX B

SITE MAPS

MDARNG Facilities IH Baseline Surveys Prince Frederick Armory, Prince Frederick, MD Project No. 55-ML-01ED-03

APPENDIX C

PHOTOGRAPHS

Prince Frederick Photo Location	Floor	Photo Numbers
Lounge/Training Rm (#104), Bar top	First	0956
Lounge/Training Rm (#104), Floor by window and display	First	0957
First Sergeants Office (#114), Table top	First	0958
Operations Office, Floor far end by desk	First	0960
Supply, Floor by desks	First	0961
Former Range Room #1, open window sill between room and drill area	First	0963
Former Range Room #2, table top	First	0964
Former Range Room #3, window sill	First	0965
Kitchen, table (counter) top	First	0966
Vehicle Maintenance Shop/Bay, floor (under amnesty box)	First	0967
Drill Room, Floor, back corner near vehicle maintenance bay door	First	0968
Drill Room. Floor, center court	First	0969
Drill Room, Floor, Corner near door to former range	First	0970
Locker and Gym Room, Floor	Second	0971
Platoon room, desk top	Second	0972
Commander/First Sergeant Offices	First	0959
Supply Office	First	0962

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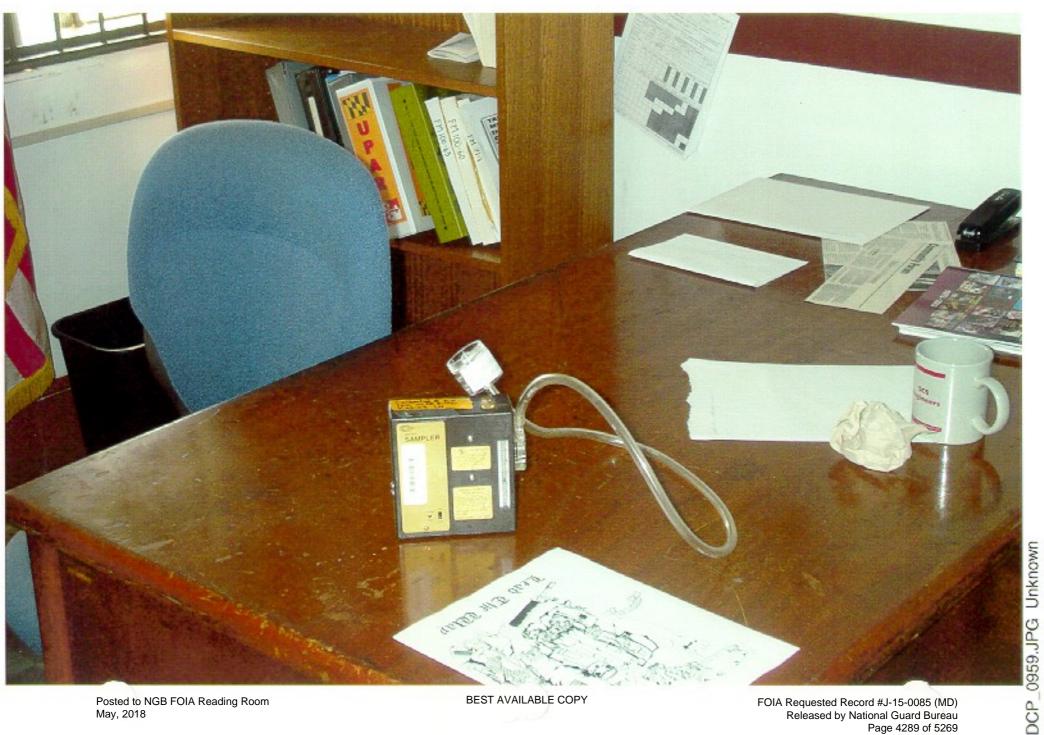


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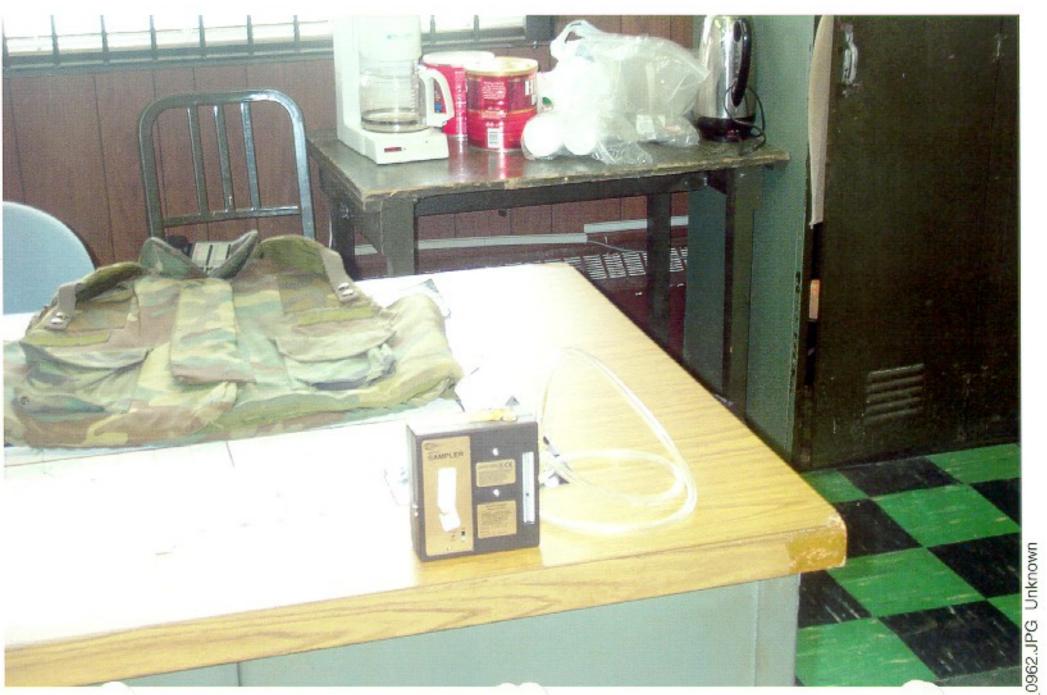
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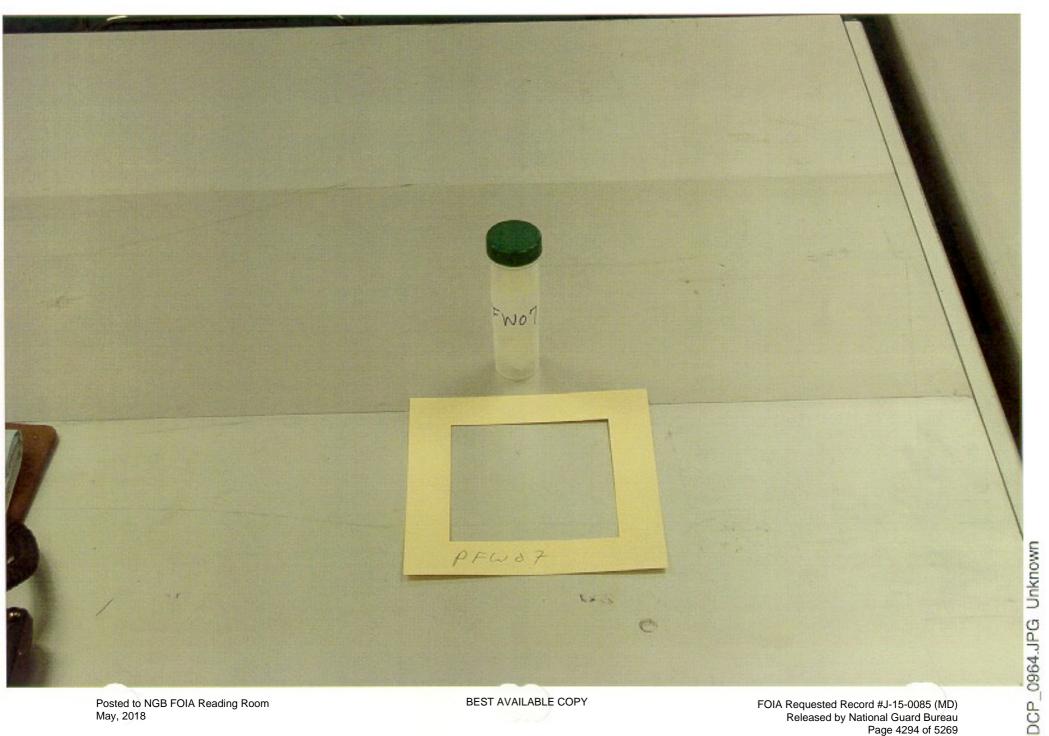
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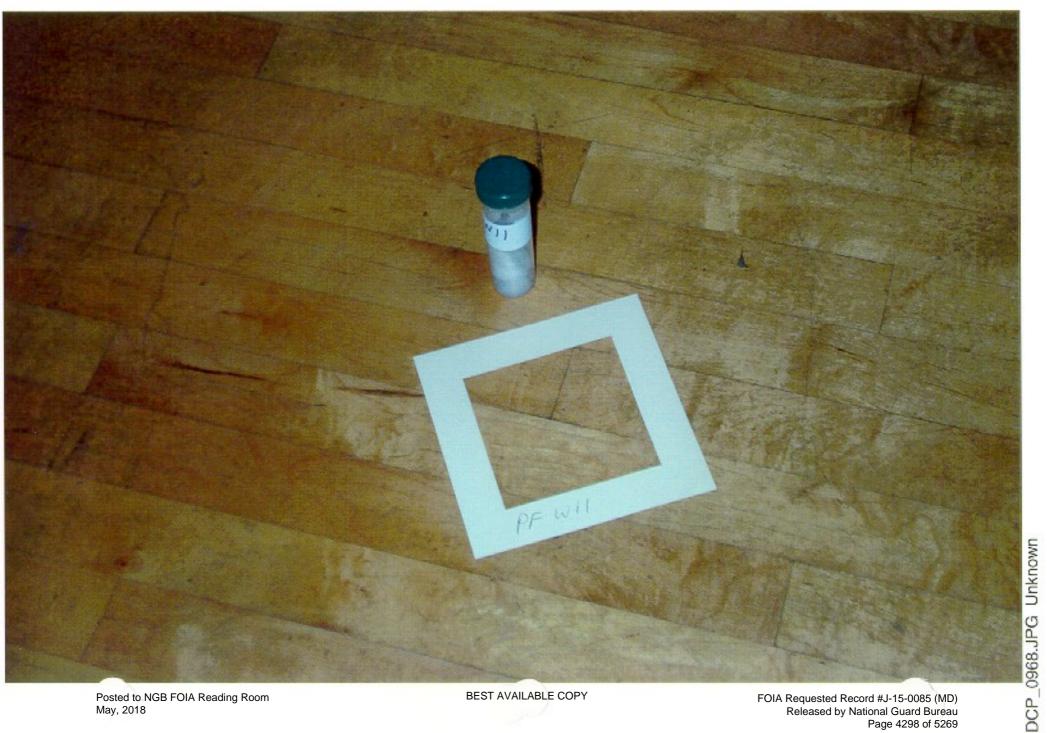
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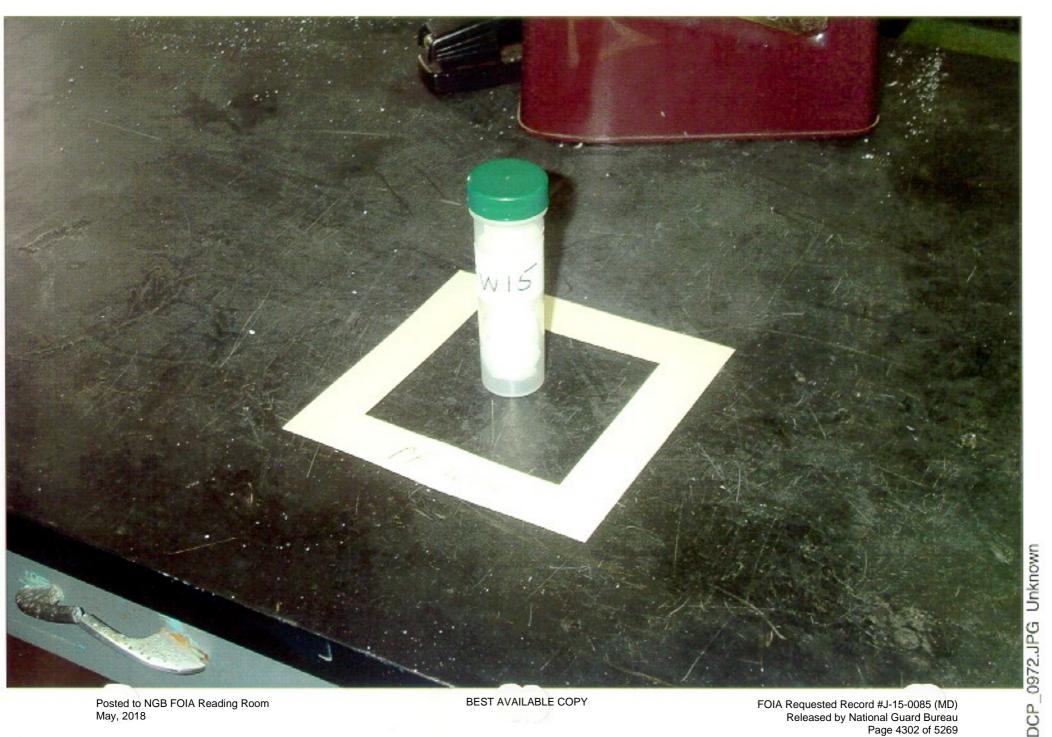
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APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

				Indoor Re	nge le	nfo				
Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Floor	Conc. (µg/ft²)	
				Yes		Yes				
PF W01	Prince Frederick	Prince Frederick					Lounge/Training Rm (#104), Bar top	First	<2.8	
PF W02	Prince Frederick	Prince Frederick					Lounge/Training Rm (#104), Floor by window and display	First	<2.8	
PF W03	Prince Frederick	Prince Frederick					First Sergeants Office (#114), Table top	First	<2.8	
PF W04	Prince Frederick	Prince Frederick					Operations Office, Floor far end by desk	First	4.1	
PF W05	Prince Frederick	Prince Frederick					Supply, Floor by desks	First	4.3	
PF W06	Prince Frederick	Prince Frederick					Former Range Room #1, open window sill between room and drill area	First	6,6	
PF W07	Prince Frederick	Prince Frederick	 				Former Range Room #2, table top	First	<2.8	
PF W08	Prince Frederick	Prince Frederick	\neg				Former Range Room #3, window sill	First	110	
PF W09	Prince Frederick	Prince Frederick	1			ŀ	Kitchen, table (counter) top	First	14	
PF W10	Prince Frederick	Prince Frederick					Vehicle Maintenance Shop/Bay, floor (under amnesty box)	First	240	
PF W11	Prince Frederick	Prince Frederick	1	i	\vdash		Drill Room, Floor, back comer near	First	3.8	
PF W12	Prince Frederick	Prince Frederick	1				Drill Room, Floor, center court	First	3.5	
PF W13	Prince Frederick	Prince Frederick					Drill Room, Floor, Corner near door to former range	First	10	
PF W14	Prince Frederick	Prince Frederick					Locker and Gym Room, Floor	Second	5.3	
PF W15	Prince Frederick	Prince Frederick					Platoon room, desk top	Second	5.7	

Table 3, Sampling Locations

Sample	Type of	Location	Floor
Numbers	Sample		<u> </u>
PF W01	Wipe	Lounge/Training Rm (#104), Bar top	First
PF W02	Wipe	Lounge/Training Rm (#104), Floor by window and display	First
PF W03	Wipe	First Sergeants Office (#114), Table top	First
PF W04	Wipe	Operations Office, Floor far end by desk	First
PF W05	Wipe	Supply, Floor by desks	First
PF W06	Wipe	Former Range Room #1, open window sill between room and drill area	First
PF W07	Wipe	Former Range Room #2, table top	First
PF W08	Wipe	Former Range Room #3, window sill	First
PF W09	Wipe	Kitchen, table (counter) top	First
PF W10	Wipe	Vehicle Maintenance Shop/Bay, floor (under amnesty box)	First
PF W11	Wipe	Drill Room, Floor, back corner near vehicle maintenance bay door	First
PF W12	Wipe	Drill Room, Floor, center court	First
PF W13	Wipe	Drill Room, Floor, Comer near door to former range	First
PF W14	Wipe	Locker and Gym Room, Floor	Second
PF W15	Wipe	Platoon room, desk top	Second
30903RR04	Air	Commander/First Sergeant Offices	First
30903RR05	Air	Supply Office	First

6. Recommendations. Repair the roof and clean up water damage.



CERTIFICATE OF ANALYSIS



Page 1 of 1

Client:

US Army - CHPPM

Job Name:

Laplata/Prince Frederick

Chain Of Custody:

117740

Address:

Attn: MCHB-TS-OFS, 5158 Blackhawk Road

Job Location:

Not Provided Date Analyzed: 09/17/2003

Aberdeen Proving Grounds, Maryland

Job Number:

Not Provided

Person Submitting:

21010-5403

P.O. Number:

Not Provided

Report Date:

17-Sep-03

Attention:



Summary of Atomic Absorption Analysis for Lead

Analysis Type Sample Type Air Volume Reporting Final Result AMA Sample Client Sample Limit Number (L) (ft³) Number 216 N/A 13.89 ug/m³ ug/m³ 0368002 30903RR01 Flame Air N/A 15 ug/m³ 206 30903RR02 Flame Air 14.56 ug/m³ 0368003 0 3 N/A 3.00 ug/m³ ug 0368004 30903RR03BL Flame Air Blank 13 0368005 30903RR04 Flame Аіг 226 N/A 13.27 ug/m³ ug/m³ 222 0368006 30903RR05 Air N/A 13.51 14 ug/m³ Flame N/A 0368007 30903RR06BL Flame Air Blank 3.00 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.

Technical Manager: G Edward Carney

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AMA Analytical Services, Inc. A Specialized Environmental Laboratory



CERTIFICATE OF ANALYSIS



Client:

US Army - CHPPM

Job Name:

MD Arng/Prince Frederick

Chain Of Custody:

117742

Address:

Attn: MCHB-TS-OFS, 5158 Blackhawk Road

Job Location: Not Provided

Date Analyzed:

9/18/2003

Aberdeen Proving Grounds, Maryland

Job Number:

Not Provided

Person Submitting:

Non-Responsiv

21010-5403

P.O. Number:

Not Provided

Report Date:

22-Sep-03

Attention:



Page 1 of 2

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
0368043	PF Blank 1	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368044	PF W01	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/fl²	
0368045	PF W02	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/fl²	
0368046	PF W03	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/fl²	
0368047	PF W04	Furnace	Wipe	****	0.108	2.79	ug/ft²		4.1	ug/ft²	
0368048	PF W05	Furnace	Wipe	****	0.108	2.79	ug/ft²		4.3	ug/ft²	
0368049	PF Blank 2	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368050	PF W06	Furnace	Wipe	****	0.108	2.79	ug/ft²		6.6	ug/ft²	
0368051	PF W07	Furnacc	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/ft³	
0368052	PF W08	Furnace	Wipe	****	0.108	69.70	ug/fl²		110	ug/ft²	
0368053	PF W09	Furnace	Wipe	****	0.108	2.79	ug/ft²		14	ug/ft²	
0368054	PF W10	Furnace	Wipe	****	0.108	139.41	ug/ft²		240	ug/ft²	
0368055	PF Blank 3	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368056	PF W11	Furnace	Wipe	****	0.108	2.79	ug/ft²		3.8	ug/ft²	
0368057	PF W12	Furnace	Wipe	****	0.108	2.79	ug/fl²		3.5	ug/ft²	
0368058	PF W13	Furnace	Wipe	****	0.108	2.79	ug/fl²		10	ug/ft²	
0368059	PF W14	Furnace	Wipe	****	0.108	2.79	ug/fl²		5.3	ug/ft²	
0368060	PF W15	Fumace	Wipe	****	0.108	2.79	ug/ft²		5.7	ug/ft²	
0368061	PF Blank 4	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	

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CERTIFICATE OF ANALYSIS



Client:

US Army - CHPPM

Job Name:

MD Arng/Prince Frederick

Chain Of Custody:

117742

Address:

Atm: MCHB-TS-OFS, 5158 Blackhawk Road

Not Provided

Date Analyzed:

9/18/2003

Aberdeen Proving Grounds, Maryland

Job Location: Job Number:

Not Provided

Person Submitting:

21010-5403

P.O. Number:

Not Provided

Report Date:

22-Sep-03

Attention:

Page 2 of 2

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number

Client Sample Number

Analysis Type

Sample Type

Air Volume (L)

(ft^r)

Limit

Final Result

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)

ug/L = parts per billion (ppb)

%Pb = percent lead by weight ug = micrograms Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Analyst: G. Edward Carney

Technical Manager:

G Edward Camey

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APPENDIX E

REFERENCES

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.
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APPENDIX F

LEAD CLEANING GUIDANCE





CHAPTER 14: CLEANING

Ste	p-b	oy-Step Summary	14–3
1.	А . В.	Performance Standard	14–5 14–5 14–5 14–5 14–6 14–6
II.	А . В.	4. Deadlines	14–6 14–6 14–6
III.	A.	eaning Methods and Procedures Containment Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques 1. HEPA Vacuuming 2. Wet-Detergent Wash 3. The HEPA/Wet Wash/HEPA Cycle 4. Sealing Floors	14–7 14–7 14–7 14–9 4–11
IV.	А . В.	Precleaning Procedures During Lead Hazard Control	4–16 4–18 4–18 4–18 4–18 4–18 4–19



Chapter 14: Cleaning



V.		der of Final Cleaning Procedures After	
	Le	ad Hazard Control	14–19
	A.	Final Cleaning	14–19
		1. Decontamination of Workers, Supplies, and Equipment	14–19
	B.	Preliminary Visual Examination	14-20
	C.	Surface Painting or Sealing of Nonfloor Surfaces	14-20
	D.	Final Inspection	14-20
	E.	Recleaning After Clearance Failure	14–20
VI.	Cle	eaning Cost Considerations	14–21
	A.	Initial Clearance Test Failure Rates	14-21
	B.	Key Factors In Effective Cleaning	14-21
	C.	Special Problems	14–21
VII	. A	Iternative Methods	14–22
	A.	Vacuums	14–22
	B.	Trisodium Phosphate and Other Detergents	14–22



Step-by-Step Summary



Cleaning: How To Do It

- 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.
- 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.
- For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
- 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.
- 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.



-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).





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.

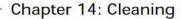
1. Low Clearance Standards

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 μg/ft² on floors.
- 500 µg/ft² on interior window sills (stools).
- 800 μg/ft² on window troughs (the area where the sash sits when closed).
- 800 μg/ft² 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.







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).



Chapter 14: Cleaning



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.

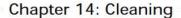
Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and triso-dium 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 finedust 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).

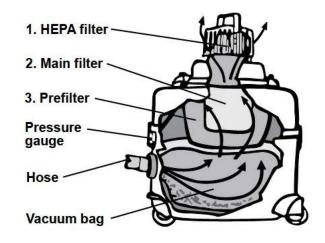
All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards and were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, 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 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 highphosphate 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

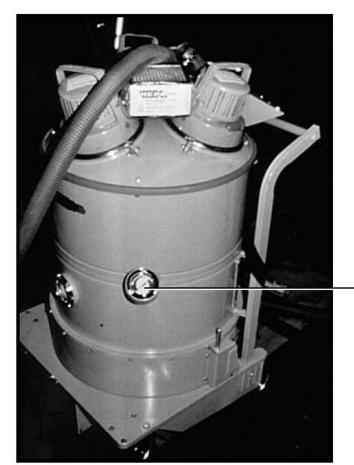


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

14-9

Pressure

gauge





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 wetwash 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. EMERGENCY EYE WASH STATION

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).

Latex

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

Neoprene

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.

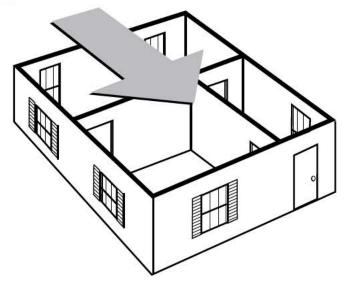
Nitrile



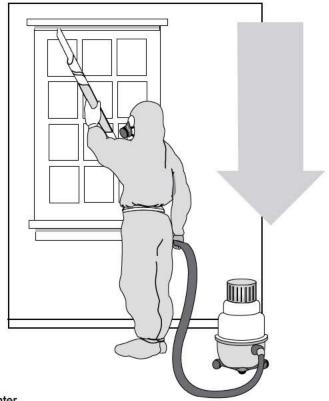


Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

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



Chapter 14: Cleaning



- 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





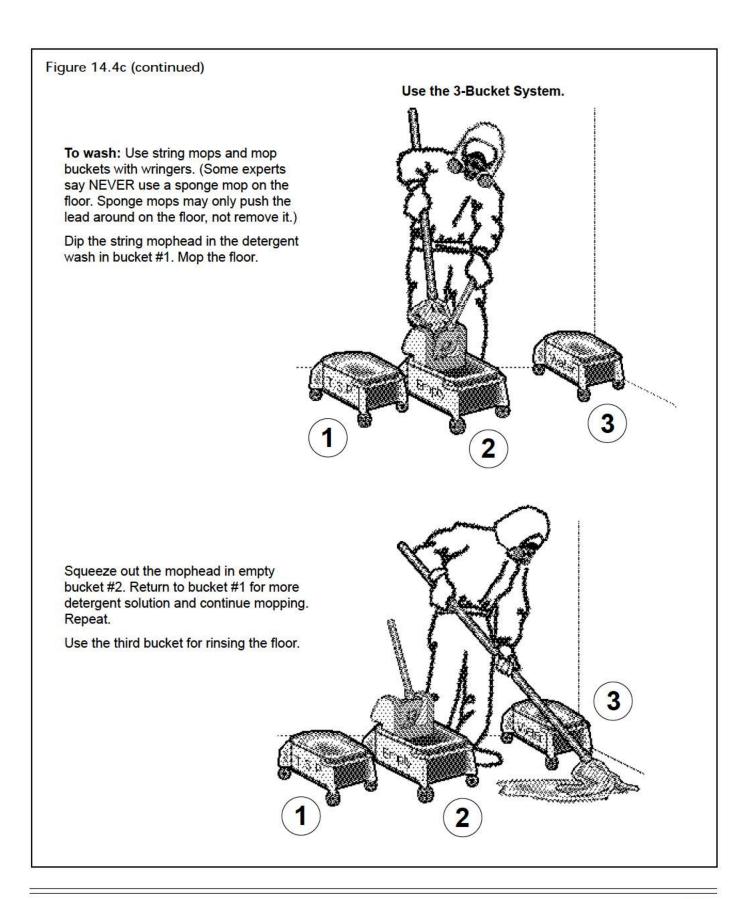


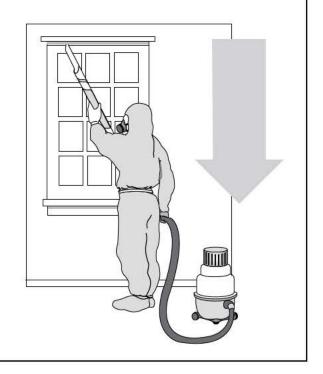




Figure 14.4d (continued)

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

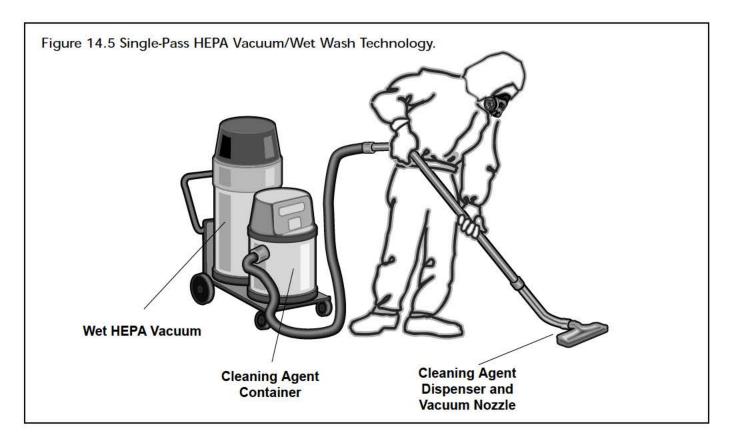
The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

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

Chapter 14: Cleaning





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



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

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

Chapter 14: Cleaning



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 dustretaining 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)



Chapter 14: Cleaning



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

	Mass Removal Efficiency Percentages Cleaning Method				
Cycle Number					
	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 Prince Frederick Armory, Prince Frederick, MD Project No. 55-ML-01ED-03

APPENDIX G

MOLD GUIDANCE

Army Facilities Management Information Document on Mold Remediation Issues

TG 277 FEBRUARY 2002



ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

INTRODUCTION	2
MOLD PREVENTION TIPS	3
REMEDIATION PLANNING	3
REMEDIATE MOISTURE AND MOLD PROBLEMS	3
REMEDIATION PROCEDURES	4
FOUR REMEDIATION LEVELS	4
HAZARD COMMUNICATION	9
CONCLUSION	10
REFERENCES	10
APPENDIX A: WATER DAMAGE CLEANUP AND MOLD PREVENTION	11
APPENDIX B: MOLD REMEDIATION GUIDELINES	14
APPENDIX C: PERSONAL PROTECTIVE GUIDANCE	17
APPENDIX D: CONTAINMENT GUIDANCE	19

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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.

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Feb 02

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

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.

TG 277

(29 CFR 1910.1200).

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 ft²) follow Level I guidance for PPE and containment and for a areas (>10 ft²) follow Medium (Level II) or when greater than 100 ft² 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.
- 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 D	amage - Cleanup and Mold Prevention
Guidelines for Response to Mold Growth£	Clean Water Damage within 24-48 Hours to Prevent
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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TG 277 ### Feb 02

£ 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 S	urface Area Affected Less Than 10 square	feet (ft ²)
Books and papers	3		
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3	Minimum N-95 respirator, gloves, and goggles	
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		None required
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

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TG 277 ### Feb 02

	MEDIUM - Tot	tal Surface Area Affected Between 10 and 1	100 ft ²
Books and papers	3	Surface Fire Fire Fire Fire Fire Fire Fire Fir	
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	Limited or Full Use professional judgment, consider	Limited Use professional judgment, consider
Non-porous, hard surfaces (plastics, metals)	1,2,3		potential for remediator/occupant exposure and size of contaminated area
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
		ce Area Affected Greater Than 100 ft ² or I lator Exposure During Remediation Estim	
Books and papers	3		
Carpet and backing	1,3,4		
Concrete or cinder block	1,3	Full	Full
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider	Use professional judgment, consider
Non-porous, hard surfaces (plastics, metals)	1,2,3	potential for remediator/occupant exposure and size of contaminated area	potential for remediator exposure and size of contaminated area
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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TG 277 ### Feb 02

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).

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 (ft²) 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 ft² 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

TG 278 February 2002



Table of Contents

Introduction	2
Safety Tips While Investigating And Evaluating Mold And Moisture Problems	2
Communicate With Building Occupants At All Stages Of Process, As Appropriate.	3
Routine Investigation And Evaluation Of Moisture And Mold Problems	3
Assessments Requiring Sampling	3
References	4
APPENDIX A: Mold Investigation Decision Logic	5
APPENDIX B: Mold Remediation Guidelines	8
APPENDIX C: Personal Protective Equipment	11
APPENDIX D: Containment Guidance	13

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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 contamination².

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

- 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 appropriate¹.

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 problems³.

- 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 contamination².

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 air⁴. 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 Control⁴."

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.

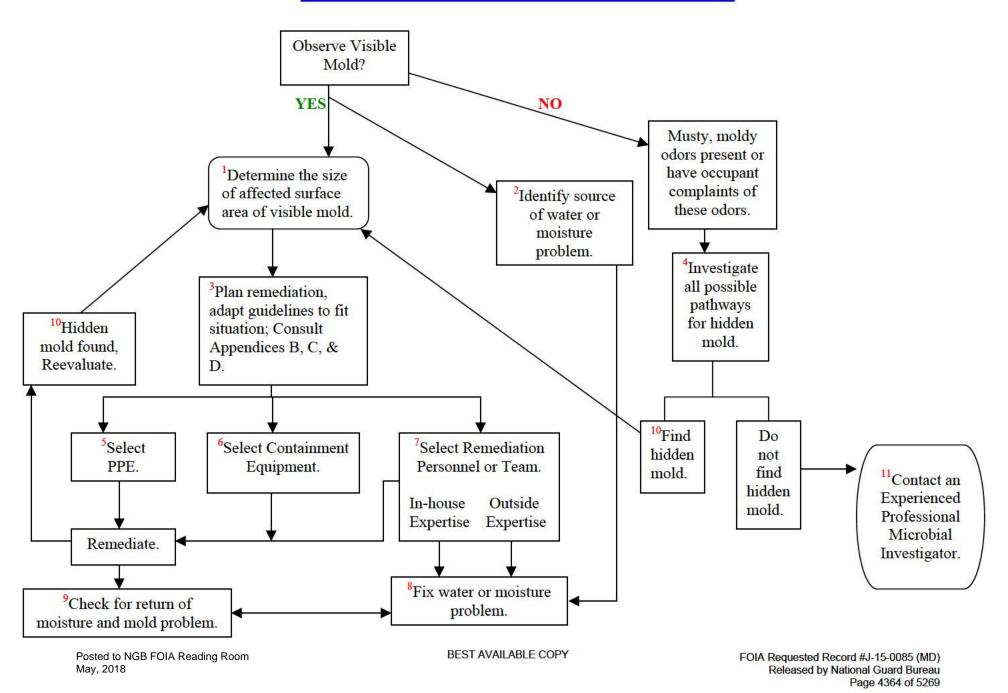
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- 2. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.
- 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



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 activities³. 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.

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
	SMALL - Total	Surface Area Affected Less Than 10 squar	re feet (ft ²)
Books and papers	3		
Carpet and backing	1, 3		
Concrete or cinder block	1, 3	_	
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3	Minimum	
Non-porous, hard surfaces (plastics, metals)	1, 2, 3	N-95 respirator, gloves, and goggles	None required
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
	MEDIUM - 7	Cotal Surface Area Affected Between 10 and	1 100 ft ²
Books and papers	3		
Carpet and backing	1,3,4	-	
Concrete or cinder block	1,3	Limited or Full	Limited
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	Use professional judgment, consider	Use professional judgment, consider
Non-porous, hard surfaces (plastics, metals)	1,2,3	potential for remediator exposure and size of contaminated area	potential for remediator/occupant exposure and size of contaminated area
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
		face Area Affected Greater Than 100 ft ² or diator Exposure During Remediation Esti	
Books and papers	3		
Carpet and backing	1,3,4		
Concrete or cinder block	1,3	Full	Full
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider potential for remediator/occupant exposure	Use professional judgment, consider potential for remediator exposure and si
Non-porous, hard surfaces (plastics, metals)	1,2,3	and size of contaminated area	of contaminated area
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

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- Limited: Disposable paper overalls can be used.
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®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

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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 ft² 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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1720 Walton Road Blue Bell, PA 19422 610-828-3078 Fax 610-828-7842

February 9, 2009

E-MAIL

Ms. Non-Responsive

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

Prince Frederick Readiness Center, Prince Frederick, Maryland 20678

IES Project No. EHS08794.02

Dear Non-Responsi

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 Prince Frederick, Maryland. Thank you for the opportunity to perform this assessment. Should you have any questions, please contact Non-Responsive or me.

Sincerely,



Senior Manager, Health, Safety & Industrial Hygiene Services

ARNG cc: , IES . IES



NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE HAVRE DE GRACE, MARYLAND

FINAL INDUSTRIAL HYGIENE ASSESSMENT PRINCE FREDERICK READINESS CENTER 195 ARMORY ROAD, PRINCE FREDERICK, MD 20678 SURVEY DATE: JULY 15, 2008

IES PROJECT NO. EHS08794.02 REPORT DATE: FEBRUARY 9, 2009

Prepared and submitted by:	Certified Industrial Hygienist review by:
Non-Responsive	
Non-Responsive	, CIH
Industrial Hygienist	Senior Manager, Health, Safety & Industrial Hygiene Services



TABLE OF CONTENTS

1.0	EXECUTIVE SUMMARY	1
	1.1 Introduction	1
	1.2 Facility Description	1
	1.3 Findings and Conclusions1.4 Recommendations	2 3
	1.4 Recommendations	3
2.0	OPERATION DESCRIPTION	4
3.0	SAMPLE RESULTS AND MEASUREMENTS	5
	3.1 Air Sampling	5
	3.1.1 Indoor Air Quality	5
	3.1.2 Airborne Lead Sampling	6
	3.2 Lead Dust Sampling	7
	3.3 Illuminance Survey	8
4.0	ONSITE OBSERVATIONS	9
	4.1 Physical Conditions of RC	9
	4.1.1 Deteriorating Paint Chip Sampling	10
	4.1.2 Asbestos-Containing Materials Sampling	10
	4.2 Housekeeping	11
5.0	EQUIPMENT AND CALIBRATION DATA	11
	5.1 Sampling Equipment List	11
	5.2 Sampling Equipment Calibration Data	11
6.0	REFERENCES	12
	TABLES	
Table	e 1 – Air Temperature, Relative Humidity, CO ₂ and CO Measurements	5
Table	e 2 – Airborne Lead Sampling Results Summary	7
Table	e 3 – Wipe Sampling Results Summary	8
T-11	4. Illiani Des l'est Communication	0
rable	e 4 – Illuminance Readings Summary	9



Table 5 – Paint Chip Sample Results	10
Table 6 – Asbestos Sample Results	11
Table 7 – Sampling Equipment List	11
Table 8 – Sampling Equipment Calibration Data	12
APPENDIX	
Appendix A – Readiness Center Photographs	
Appendix B – Indoor Air Quality Sample Location Map	
Appendix C – Air, Wipe, and Paint Chip Sampling Results	
Appendix D – Lead Wipe Sample Location Map	
Appendix E – Illuminance Readings Map	
Appendix F – Asbestos Sample Results	



1.0 EXECUTIVE SUMMARY

1.1 Introduction

Assessment Date: July 15, 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 195 Armory Road in Prince Frederick, 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. Non-Responsive, Industrial

Hygienist, of IES, performed the assessment under the direction of Mr.

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: Non-Responsive, Supervisor, Prince Frederick Readiness Center

1.2 Facility Description

Prince Frederick RC, located at 195 Armory Road, Prince Frederick, Maryland is a 7,945-square foot training facility constructed of an exterior of brick and block masonry on a concrete slab. The interior construction is mostly concrete. The facility has a built up roof top with the original wood decking. The facility contains offices, training rooms, a drill hall, kitchen and garage. Photographs of the facility, equipment and activities are located in Appendix A of this report.

The RC is a two story training facility. A majority of the offices are located on the First Floor, with the Second Floor dedicated to locker storage. The facility is not ventilated through a single system, but a majority of the offices has window units to cool the space in the warmer months of the year. Normal working hours for the two full time personnel (one maintenance and one administrative) are generally Tuesday through Friday from 0630 to 1700. Training at the facility occurs once a month for a week duration. On the day of the IH assessment, the shop was maintained by one administration personnel and one maintenance personnel.



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, one supervisor and one caretaker.
 During a normal 10-hour day, the supervisor performs logistical work while the caretaker maintains the facility and grounds.
- Airborne lead was not detected in the one personal air sample and one area air sample collected on the day of the assessment. The airborne lead concentrations in each of the air samples were reported at less than 3.4 micrograms of lead per cubic meter of air (μg/m³), which is well below the OSHA Action Level of 40 μg/m³ 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 (µg/ft²). 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 71.9°F to 80.2°F, as compared to an outdoor temperature of 82.4°F. Some 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). On the day of the assessment, IES was informed that only two individuals routinely occupy the facility and use Rooms 121 and 122, which were within the range suggested by ASHRAE on the day of the assessment. Indoor relative humidity ranged from 59.6% to 62.1% in the facility, as compared to an outdoor level of 66.9%. Most of the relative humidity levels measured in the interior of the building were higher than the generally recognized comfort range of 30 to 60%. Relative humidity levels above 60% are conducive to microbial growth for cellulose-based building materials such as drywall and ceiling tiles.
- The majority of building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. However, IES observed deteriorating paint within the kitchen and boiler room within the facility. IES collected paint chip samples from these areas. IES also collected bulk building materials from the Supervisor's Office (Room 121) and from the kitchen to be analyzed for their asbestos content. No asbestos was detected in either of the bulk samples.
- Gray floor paint within the Boiler Room and Kitchen were identified as lead based (3.9%).
 Approximately 5 square feet of this paint was damaged in the Kitchen and 10 square feet was damaged in the Boiler Room.



- Mold growth was identified within the storage area of the Supervisor's Office, above the lockers. Water damage was also identified at entrance to supervisor's office. IES was informed that the water-damaged areas were due to roof leaks. IES was also informed that the roof underwent repair a year before the assessment date.
- Various health and safety items were identified during the comprehensive survey. These include:
 - o NFPA sign on the 4,000-gallon fuel storage tank did not contain the appropriate numbering
 - o Emergency lighting did not light when tested

1.4 Recommendations

IES' recommendations resulting from this assessment are included in a separate document entitled, "Prince Frederick_RC_08_Recommendations."



2.0 OPERATION DESCRIPTION

INSTALLATION: RC Army National Guard

BUILDING: 195 Armory Road, Prince Frederick, Maryland 20678

LOCATION: Site wide

OPERATION DESCRIPTION: On the day of the assessment, IES witnessed routine operations for the RC. One maintenance personnel was performing general maintenance on the facility and the grounds. This includes cleaning the latrines, cleaning windows and other building materials. IES was informed that these activities commence on a very regular basis. Training at the RC occurs once a month, a week 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.

VENTILATION SYSTEM EVALUATION: The facility is not conditioned by a single air handling system. The building is naturally ventilated through open doors and windows. The Drill Hall is equipped with exhaust ventilation which is used during physical activities on drill weeks. Some offices are equipped with window units to cool individual spaces.

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 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 µg/ft². 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. Deteriorating paint was observed within the kitchen and boiler room within the facility. Approximately 15 squure feet (total) of Lead based paint is damaged on the floor of the Boiler Room and Kitchen. Bulk samples collected from building materials from the Supervisor's Office (Room 121) and from the kitchen indicated no asbsestos. Mold growth was identified within the storage area of the Supervisor's Office, above the lockers. Water damage at entrance to supervisor's office due to previous roof leaks. Temperature and relative humidity were higher than the recommended levels for comfort on the day of the assessment.



3.0 SAMPLE RESULTS AND MEASUREMENTS

3.1 Air Sampling

3.1.1 Indoor Air Quality

Measurements of air temperature, relative humidity, and CO₂ 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, CO₂, 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, CO₂, AND CO MEASUREMENTS

Date of Assessment: July 15, 2008

Location: National Guard RC, Prince Frederick, Maryland Analyte(s): CO₂, CO, Temperature, and Relative Humidity

Exposure Guidelines: CO₂: Indoor CO₂ 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 °F to 79 °F (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 (°F)	Measured Relative Humidity (%)
A	Room 121 - Area Sample (AS) – Approximately four feet above the ground at the center of Room 121.	1110 – 1114	4 Min.	536	0	71.9	60.5
В	Room 118 – AS – Approximately four feet above the floor at the center of the Orderly Office.	1114 – 1118	4 Min.	571	0	80.2	59.6
С	Room 114 – AS – Approximately four feet above the floor at the center of the 1SG Office.	1118 – 1122	4 Min.	589	0	79.5	60.4
D	108 – AS – Approximately four feet above the floor at the center of the lobby.	1122 – 1126	4 Min.	606	0	79.6	60.4



Sample ID	Sample Description	Start - End Time (hh:mm)	Sample Time	CO ₂ (ppm)	CO (ppm)	Measured Temperature (°F)	Measured Relative Humidity (%)
Е	Room 107 – AS – Approximately four feet above the floor at the center of the EM Lounge	1126 – 1130	4 Min.	723	0	79.5	60.6
F	101 – AS – Approximately four feet above the floor at the center of the Drill Hall.	1130 – 1134	4 Min.	645	0	79.5	60.8
G	122 – AS – Approximately four feet above the floor in the former rifle range.	1134–1138	4 Min.	682	0	75.6	62.1
Н	Maintenance – AS – Approximately four feet above the floor at the center of Normaceponeur Office.	1138 – 1142	4 Min.	600	0	75.6	62.1
I	122 – AS – Approximately four feet above the floor in the former rifle range.	1142 – 1146	4 Min.	622	0	75.6	62.1
J	Outdoor – AS – Approximately four feet above the ground outside of the RC.	1146 - 1150	4 Min.	349	0	82.4	66.9

Note: - All airborne CO2 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 meters of air sample (μg/m³) 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 PEL for lead is expressed in terms of 8-hour TWA. 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)



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, "Prince Frederick RC 08 Medical."

TABLE 2 AIRBORNE LEAD SAMPLING RESULTS SUMMARY

Date of Monitoring: July 15, 2008

Location: Army National Guard RC, Prince Frederick, Maryland

Analyte(s): Lead

Occupational Exposure Limits: Lead: OSHA PEL-TWA = $50 \mu g/m^3$

OSHA Action Level (TWA) = $30 \mu g/m^3$

Sample ID	Equipment ID	Sample Description	Start Time	End Time	Sample Time (Min.)	Flow Rate (lpm)	Air Volume (l)	Measured Airborne Contaminant Concentration
071508- A001	110	Drill Hall – Area Sample - Operator Breathing Zone (AS-OBH) – During normal operations within in the Readiness Center.	0715	1435	440	1.99	875.6	<3.4 μg/m ³
071508- A002	103	Supervisor (Raymond Bean) – Personal Sample - Operator Breathing Zone (PS- OBH) – During normal operations within Room 121 in the Readiness Center.	0715	1435	440	2.01	884.4	<3.4 μg/m ³

Note: - Sample results for lead are expressed as micrograms contaminant per cubic meter of air (μg/m³)

- PEL-TWA = OSHA Permissible Exposure Level, 8-Hour TWA

3.2 Lead Dust Sampling

IES performed wipe sampling in the Drill Hall, converted rifle range 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 ($\mu g/ft^2$) 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, "Prince Frederick RC 08 Medical."



TABLE 3 – WIPE SAMPLE RESULTS SUMMARY

Date of Monitoring: July 15, 2008

Location: Army National Guard RC, Prince Frederick, Maryland

Analyte(s): Lead

Occupational Exposure Limits: ARNG Recommends Cleaning = $200 \mu g/ft^2$

Sample ID	Sample ID	Location	Area of Surface Sampled	Measured Lead Surface Contamination (μg/ft²)
Α	071508-SW001	Drill Hall -Wipe Sample (WS)- Surface of table outside kitchen	100 cm ²	<110
В	071508-SW002	Drill Hall -WS-Surface above-head ledge outside kitchen	100 cm ²	650
C	071508-SW003	Drill Hall -WS-Floor surface at center court	100 cm ²	<110
D	071508-SW004	Kitchen -WS-Surface microwave in kitchen	100 cm ²	<110
E	071508-SW005	Supply Office -WS-Surface of floor within Room 121	100 cm ²	<110
F	071508-SW006	Former IFR -WS-Light fixture in the former IFR	100 cm ²	<110
G	071508-SW007	Former IFR -WS-Floor surface outside the former IFR	100 cm ²	<110
Н	071508-SW008	Former IFR -WS-Floor surface outside the former IFR	100 cm ²	<110
I	071508-SW009	Lobby -WS-Floor surface of the main lobby	100 cm ²	<110
J	071508-SW010	CDR's Office -WS-Floor surface of Room 116	100 cm ²	<110
K	071508-SW011	Supply Office -WS-Surface of floor within Room 121	100 cm ²	230
L	071508-SW012	Supply Office -WS-Surface of floor within Room 121	100 cm ²	<110
M	071508-SW013	EM Lounge -WS-Surface of table within the EM Lounge	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. 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 E for sample locations.



TABLE 4 ILLUMINANCE READINGS SUMMARY

Survey Dates: July 15, 2008

Location: Army National Guard RC, Prince Frederick, Maryland

Sample ID	Sample Description	Average Illuminance Measurements (fc)	ARNG Recommended Illuminance Value (fc)
Α	Main Lobby - Center of lobby	42.8	10
В	Room 116 - Center of Room	33.3	50
C	Room 118 – Center of Room	55.6	50
D	Hallway – Hallway outside Room 121	77.1	5
E	Room 117 - Center of room	10.2	50
F	Room 118 - Center of room	17.2	50
G	Supply - Center of supply area in Room 121	66.7	5
Н	Room 101A – Center of room	6.5	50
I	Room 101B – Center of room	7.3	50
J	Room 105 – Center of room	49.6	50
K	Room 106 – Center of room	15.3	50
L	Room 107 – Center of room	14.8	50
M	Latrine - Center of latrine	32.4	7
N	Garage Area – Center of Garage	9.7	75
0	Latrine - Center of Garage Latrine	25.0	7
P	Supply Area – Center of Supple Area (103)	30.0	5

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, "RC_3_08_Field_Notes."

4.1 Physical Condition of RC

The majority of building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. However, IES observed deteriorating paint within the kitchen and boiler room within the facility. IES collected paint chip samples from these areas. IES also collected bulk building materials from the Supervisor's Office (Room 121) and from the kitchen to be analyzed for their asbestos content. IES observed mold growth within the storage area of the Supervisor's Office, above the lockers due to previous roof top leaks Results of the building materials assessments are presented below.



4.1.1 Deteriorating Paint Chip Sampling

IES performed a visual inspection of the building materials and observed deteriorating paint throughout the shop. IES collected three paint chip samples of various colors and substrates. The paint chip samples were shipped via overnight courier to AMA. The sample was analyzed for lead content using the EPA 600 flame atomic absorption method. All sample results were reported in percent lead for the purposes of this assessment. Lead-based paint is considered any paint or surface coating that contains lead equal to or exceeding one milligram per square centimeter (mg/cm²) or is 0.5% lead by weight

This report's findings are based on the paint chip samples collected during the assessment, which are summarized in Table 5. Refer to Appendix C for the complete laboratory sample analysis results.

TABLE 5 PAINT CHIP SAMPLING SUMMARY

Date of Assessment: July 15, 2008

Location: Army National Guard RC, Prince Frederick, Maryland

Sample Number	Sample Location	Paint Color	Result
LBP-001	Brick Wall in Kitchen	Yellow	0.38%
LBP-002	Piping in Boiler Room	Yellow	0.048%
LBP-003	Painted Floor in Boiler Room and Kitchen	Gray	3.9%

4.1.2 Asbestos-Containing Materials Sampling

IES performed a visual inspection of the building and observed damaged building materials that could possibly be asbestos-containing materials (ACM). IES collected two bulk samples of building materials. Samples were shipped to AMA, a National Voluntary Laboratory Accredited (NVLAP) laboratory (NVLAP 101143-0) where they were analyzed by Polarized Light Microscopy (PLM), which classifies a material as asbestos-containing if it contains greater than one percent asbestos. Asbestos was not detected in the building material samples collected.

This report's findings are based on the bulk ACM samples collected during the assessment, which are summarized in Table 6. Refer to Appendix G for the complete laboratory sample analysis results.



TABLE 6 ASBESTOS CONTAINING MATERIALS SAMPLING SUMMARY

Date of Assessment: July 15, 2008

Location: Army National Guard RC, Prince Frederick, Maryland

Sample Number	Sample Location	Material Color	Result
ACM-001	Kitchen Ceiling Plaster	Off White	NAD
ACM-002	Room 121 Textured Ceiling Paint	Beige	NAD

Notes: - NAD = No Asbestos Detected

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.

5.0 EQUIPMENT AND CALIBRATION DATA

5.1 Sampling Equipment List

Table 7 lists the sampling equipment that was used as a part of the assessment.

TABLE 7 SAMPLING EQUIPMENT LIST

Equipment Type	Make/Model	Equipment/Serial Number	Equipment Identification
Personal Sampling Pump	MSA Escort ELF	110	110
Personal Sampling Pump	MSA Escort ELF	103	103
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 8 details the calibration data for each piece of sampling equipment used during the assessment.



TABLE 8 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)
110	DryCal-ML	7/15/08	2.01	7/15/08	2.01	2.01
103	DryCal-ML	7/15/08	1.99	7/15/08	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	7/15/08	Zero Gas: 0 ppm CO ₂ ; 0 ppm CO Span Gas 1,000 ppm CO ₂ ; 35 ppm CO	7/15/08	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 – Assembly Hall





Photograph #3 – RC Kitchen



Photograph #4 – Converted Rifle Range





Photograph #5 – Visible Mold in Supervisor's Office

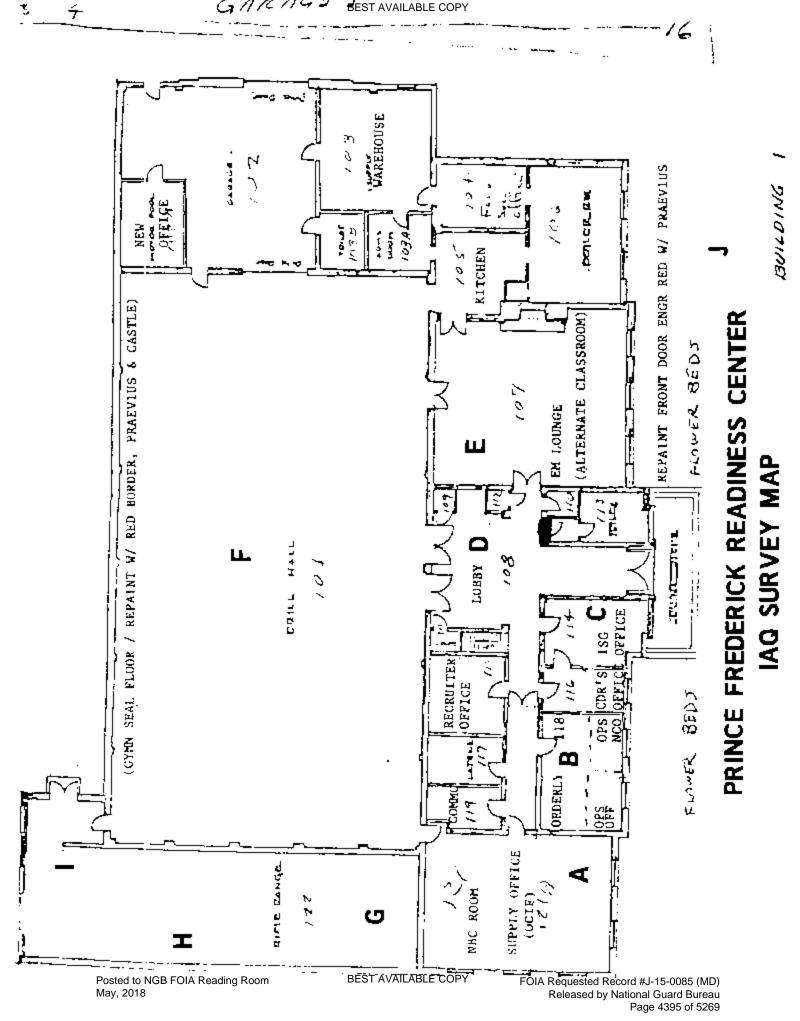


Photograph #6 – Water Damage at Entrance to Supervisor's Office



APPENDIX B

INDOOR AIR QUALITY SAMPLE LOCATION MAP





APPENDIX C

AIR, WIPE, AND PAINT CHIP SAMPLING RESULTS

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCARONTED LA

Chain Of Custody:

Address: 301-IH Old Bay Lane, Attn: NGB-AVN-SI, Havre de Grace, Maryland 21078 State Military Reservation National Guard Bureau

Client

Job Location: Job Name: Not Provided

P.O. Number:

Not Provided EHS08794.02

Job Number:

Prince Frederick, MD

Date Submitted:

Date Analyzed: Person Submitting:

7/22/2008

159372

Report Date:

7/24/2008

FOIA Requested Record #J-10085 (MD)
Released by National Guard Bureau
Page 4397 of 5269

Summary of Atomic Absorption Analysis for Lead

									DL	.31	AV	AIL	ADL	Ŀ	JUF	١
	0871084	0871083	0871082	0871081	0871080	0871079	0871078	0871077	0871076	0871075	0871074	0871073	0871072	0871071	0871070	
	071508-SW015	071508-SW014	071508-SW013	071508-SW012	071508-SW011	071508-SW010	071508-SW009	071508-SW008	071508-SW007	071508-SW006	071508-SW005	071508-SW004	071508-SW003	071508-SW002	071508-SW001	
Flames	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	
À ;;	Wipe Blank	Wipe Blank	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	
876	***	* * *	* * *	***	**	***	* * *	**	***	***	* * *	* * *	*	***	:	
N/A	N/A	N/A	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	
3 42	12,00	12.00	111.52	111.52	111.52	111.52	111.52	111.52	111.52	111.52	111.52	111.52	111.52	111.52	111.52	
110/1113	ug	gu	ug/ft²	ug/ft²	ug/ft²	ug/ft²	ug/it ^r	ug/ft ²	ug/ft ²	ug/ft ²	ug/ft	ug/ft?	ug/ft	ug/ti	ug/it²	
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ug/m³	ă	#\$	ug/π²	ພ <u>ຍ</u> /#*	ug/fi²	ug/ff²	ug/ft²	ug/ft²	ug/fi²	ug/ft²	ug/ft²	ug/ft²	ug/H*	ug/ff²	ug/ft²	
R	ead	ling	Roo	om					BE	EST	AV	AIL	ABI	E C	COP'	Y

BEST AVAILABLE COPY

AMA Sample Number

Client Sample Number

Analysis Type

Sample Type

Air Volume

Area Wiped

Reporting

Final Result

Comments

Attention:

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 not formation. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless collected by personnel of these Laboratories, we expressly disclation applies only to polarized light 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. All rights reserved.

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CERTIFICATE OF ANALYSIS

ACCAROLIES LA

Address: Client State Military Reservation 301-IH Old Bay Lane, Attn: NGB-AVN-SI, Havre de Grace, Maryland 21078 National Guard Bureau

> Job Location: Job Name: Not Provided

Prince Frederick, MD

P.O. Number:

Not Provided EHS08794.02

Job Number:

Chain Of Custody:

Date Submitted:

7/22/2008 159372

NY EI

Person Submitting

Date Analyzed:

Report Date:

7/24/2008

7/24/2008

FOIA Requested Record #3-05-0085 (MD)
Released by National Guard Bureau
Page 4398 of 526

Summary of Atomic Absorption Analysis for Lead

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B Sample Type Paint Chip Air Volume *** *** Area Wiped N/A N/A **F** See QC Summary for analytical results of quality control samples 0.010.01 Reporting %Рь %РЬ Final Result 0.0483.9 %РЪ Comments

NY ELAP accrediation applies only to paint chip, wipe, and water

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associated with these sampes

samples

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7421; water: SM-3113B mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)

N/A = Not Applicable %Pb = percent lead by weight

ug = micrograms

ug/L = parts per billion (ppb)

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AMA Sample

Client Sample

Analysis Type

Attention:

Number

0871089

LBP-002

Flame Flame

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

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

Air and Wipe results are not corrected for any blank results

Analyst: Melissa Sam

Technical Manager:

G Edward Carney

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 applies only to 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, or sample and insidity for the accuracy and completeness of these Laboratories, we expressely dischain any knowledge and liability for the accuracy and completeness.

This information, Residual sum and accreditation applies only to polarized light microscopy of bulk samples and the client. NYLAP accreditation applies only to polarized light microscopy of the samples and completeness. May, 2018

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

STAR HI 159372

Directly

4. Comments:	3. Results Reported To:	2. Date/Time Analyzed:/	LABORATORY STAFF ONLY: (CUSTODY) 1. Date/Time RCVD: / Q /	07508- Swors	510WS-805170	11ans-805170	071508-5WOID	071508-5W009	80000 - 80000		. \	07/508-520005	Ι.	671508-SW003		90/21/2	CLIENT ID SAMPLE INFORMATION CLIENT ID SAMPLE LOCATION/ NUMBER IDENTIFICATION DATE		198.1 El AP 198.6	☐ EPA 600 – Visual Estimate (QTY) ☐ EPA Point Count (QTY)		□ NIOSH 7402(QTY)	PC MCE Porosityin a 25mm 37mm	dicate Filter T		PC MCE Porosity in a 25mm 37mm	A sheetes A majusis	ne Results Requi	Dispose include COC/field data sharts with results.	Address 3:	Address 2: 10	2. Address 1: 1720 Co. 725	ailing/Billing Information:	www.amalab.com
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4475 Forbes Blvd. • Lanham, MD 20706 (301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643 AMA Analytical Services, Inc. A CAN AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)

CHAIN OF CUSTODY

Number For Inquires) (Please Refer To This

office 159371

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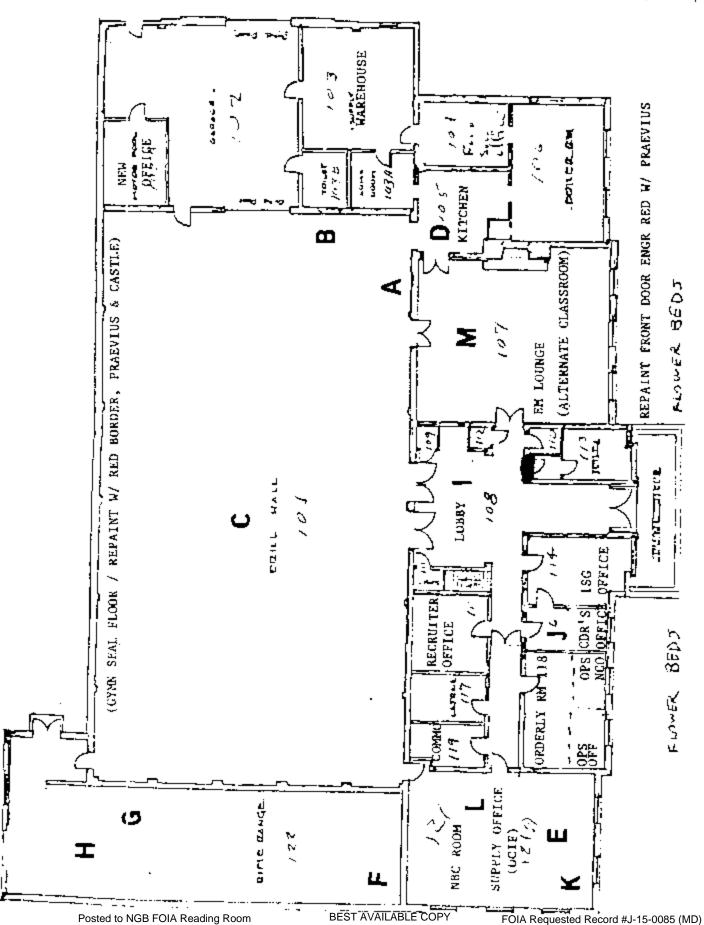


APPENDIX D WIPE SAMPLING LOCATION MAP

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May, 2018

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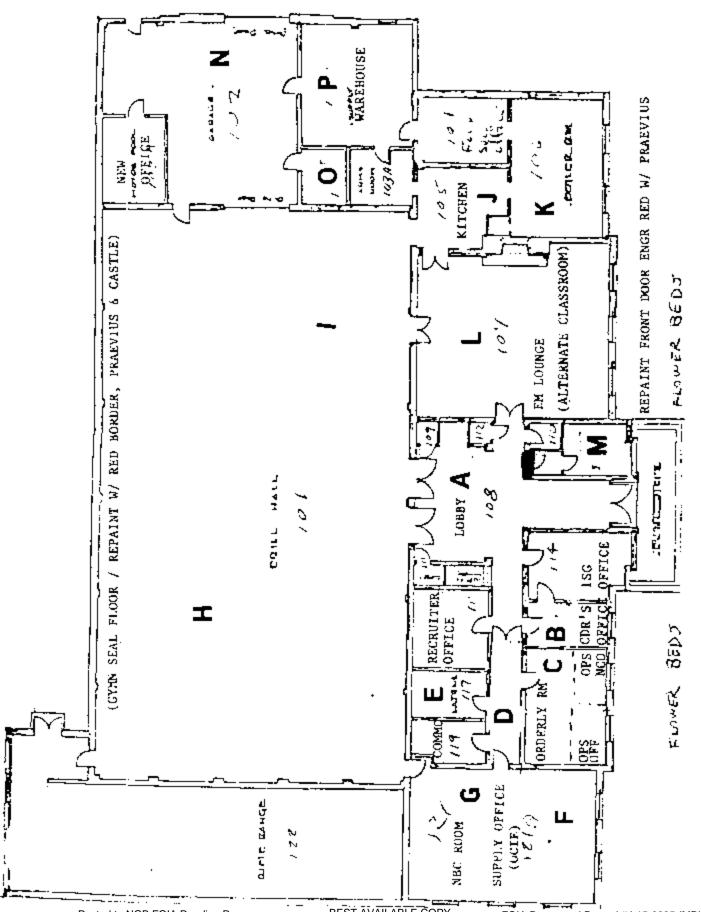


APPENDIX E ILLUMINANCE READING MAP

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PRINCE FREDERICK READINESS CENTER ILLUMINATION SURVEY MAP

FOIA Requested Record #J-15-0085 (MD)
Released by National Guard Bureau
Page 4404 of 5269



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APPENDIX F ASBESTOS SAMPLE RESULTS



AMA Analytical Services, Inc. A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

. Wwlap

159372

Person Submitting: Chain Of Custody: Date Analyzed: Prince Frederick, MD EHS08794.02 Not Provided Not Provided Job Location: P.O. Number: Job Number: Job Name: 301-IH Old Bay Lane, Attn: NGB-AVN-SI, Havre de Grace, Maryland 21078 State Military Reservation National Guard Bureau

Light Microscopy
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Summary

Attention:

Page I of I

1			
	Comments		
	Analyst ID	۸s	۸s
	AMA.Sample Client Total Chrysotile Amosite Crocidolite Other Mineral Fiberglass Organic Synthetic Other Particulate Sample Homogeneity Analyst Number Sample # Asbestos Percent Percent Percent Percent Color ID Percent Percent Percent Percent Percent Percent Color Decent Percent	Off-White Homogeneous	Heterogenous
The second secon	Sample Color	Off-White	Beige
	Particulate Percent	\$	8
	Other	ı	1
	Synthetic Percent	ı	t
	Organic Percent	 T.	01
	Fiberglass Percent	ı	1
	Mineral Wool Percent	1.5	:
	Other Asbestos Percent	1	ı
	Crocidolite Percent	ı	!
	Amosite Percent	:	ı
	Chrysotile Percent	1	ı
	Total Asbestos	NAD	NAD
-	Client Sample #	ACM-001	ACM-002
	AMA Sample Number	0871091	0871092

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

- 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 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 of optical microscopy.
- 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 gravimentic 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

TR = "Trace equals less than 1% of this component" NAD = "No Asbestos Detected"

Uncertainty: For samples containing asbestos in range of 1-10% the CV is 0.43, 11-35% CV=0.55, >35 CV=0.23

一つなら

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 the client. NVLAP accreditation any isoparized high microscopy of bulk samples and 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 high 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. All rights reserved. AMA Analytical Services, Inc.

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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

MAY 1 1 2007

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

SUBJECT: Maryland Army National Guard Facilities, Industrial Hygiene Baseline Survey, COL Victor P. Gillespe Armory, Queen Ann, MD, Report No. 55-ML-01ED-03/07, 26 August 2003

- 1. Enclosed is the final copy of the subject report with two CD-ROMs.
- 2. Our point of contact is Ms. at commercial (410) 436-5475/3118, DSN 584-5475/3118, or electronic mail: ponsive@us.armv.mil.

FOR THE COMMANDER:

Encl

Director, Occupational Health Sciences

CF: (wo/CD-ROMs) USACHPPM-NORTH (MCHB-AN-IH/MR. Non-Responsive

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 COL VICTOR P. GILLESPE ARMORY QUEEN ANNE, MD 26 AUGUST 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





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

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 (revers



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
COL VICTOR P. GILLESPE ARMORY
QUEEN ANNE, MD
26 AUGUST 2003

- 1. PURPOSE. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) COL Victor P. Gillespe Armory, Queen Anne, MD, to identify and measure the existence and extent of potentially hazardous operations or conditions. 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. Significant health and safety concerns were extremely high levels of lead in surface dust in the former indoor firing range (IFR); small areas of deteriorating paint-containing lead, which could generate lead dust hazards if not remedied; the lack of any record of an asbestos survey; and the lack of written occupational safety and health programs.

3. RECOMMENDATIONS.

- a. <u>Lead Exposure</u>. Health Risk Assessment Code (RAC) 2.
- (1) Establish and execute a lead hazard management plan for all lead in the facility, and take immediate corrective action where a possible lead-related health hazard has been identified.
 - (2) Repair and stabilize all deteriorated paint in the Armory.
- (3) Clean all areas in and adjacent to the former IFR immediately, and clean other areas where sampling results showed elevated levels of lead. Follow the guidelines for cleaning in Appendix E of the report. Ensure that cleaning is performed in compliance with the Occupational Safety and Health Administration Lead in Construction Standard, Title 29 Code of Federal Regulations Part 1926.62, and National Guard Pamphlet 420-15.

Readiness thru Health



- (4) If cleaning cannot be accomplished immediately, restrict access to the former IFR by keeping it locked. Post a sign warning against entry except in an emergency and against storing any material there. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. Address all potential lead hazards before extending this facility for use by children. If children will use this facility in the future, clean surfaces to the Environmental Protection Agency and State of Maryland lead in dust standard for children under 6 years of age of 40 micrograms per cubic meter of foot ($\mu g/ft^2$) on floors. Clean all remaining areas to the National Guard Bureau Region North Industrial Hygiene Office and United States Army Center for Health Promotion and Preventive Medicine recommended level of 200 $\mu g/ft^2$ for lead in dust on all other surfaces.
- b. <u>Asbestos Exposure</u>. No RAC can be assigned at this time. Perform an asbestos survey and take action on the results as required.
- c. <u>Occupational Safety and Health Programs</u>. Health RAC 4. Ensure that written programs are developed, implemented, and maintained.
 - d. Safety. Safety RAC 4. Eliminate trip hazards such as extension cords.

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MDARNG Industrial Hygiene Baseline Survey, COL Victor P. Gillespe Armory, Queen Anne, MD, Report No. 55-ML-01ED-03/07, 26 August 2003

CONTENTS

Pa	ragraph
1.	REFERENCES
2.	PURPOSE1
3.	AUTHORITY1
4.	GENERAL 1
5.	METHODOLOGY2
6.	FINDINGS AND DISCUSSION
7.	CONCLUSIONS5
8.	RECOMMENDATIONS
9.	ADDITIONAL ASSISTANCE6
ΑI	PPENDICES
A.	REFERENCES
В.	ASSESSMENT CRITERIA FOR LEADB-1
C.	PHOTOGRAPHS
D.	LABORATORY REPORTS
E.	LEAD CLEANING GUIDANCE
F.	MOLD CLEANING GUIDANCEF-1

MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEY REPORT NO. 55-ML-01ED-03/07 COL VICTOR P. GILLESPE ARMORY QUEEN ANNE, MD 26 AUGUST 2003

- 1. REFERENCES. See Appendix A.
- 2. PURPOSE. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) COL Victor P. Gillespe Armory, Queen Anne, MD, to identify and measure the existence and extent of potentially hazardous operations or conditions. 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. AUTHORITY. Fax, National Guard Bureau (NGB) Region North Industrial Hygiene Office (NGB-ARS-IHNE/Ms. Non-Responsive), 28 February 2003.
- 4. GENERAL.
- a. <u>Personnel Contacted</u>. SSG Non-Responsive, Environmental Compliance Assessment Coordinator, MDARNG; SFC Non-Responsive, Facility Manager; SFC Non-Responsive Readiness NCO; and Mr. Non-Responsive, Caretaker.
- b. <u>Survey Personnel</u>. Ms. Non-Responsive, Industrial Hygienist, United States Army Center for Health Promotion and Preventive Medicine (USACHPPM), conducted this survey on 26 August 2003.
- c. <u>Risk Assessment Codes (RACs)</u>. 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. <u>Background</u>. The Armory was built in 1976. No floor plan could be located for this report. The Armory mission was recruitment and retention. The resident units included

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.

Detachment 1, Company B, 2nd Battalion, and 115th Infantry Regiment. Two personnel occupied the Armory during the week. At the time of the survey, most personnel were at Chestertown Armory. Armory personnel stated that the Queen Anne Armory might be closed in the near future. The point of contact stated that children did not visit the Armory. However, the Armory was advertised at the time of the site visit on the Maryland Military Department internet home page Armory rental list for community use, so there was a potential for future use for children.

5. METHODOLOGY.

- a. <u>Assessment Criteria</u>. 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 Threshold Limit Value®. The NGB criterion for lead in surface dust is discussed in Appendix B. The American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) publishes criteria for indoor air quality. The National Fire Protection Association provides standards for fire and life safety. The Illumination Engineering Society North America provides standards for minimum light levels.
- b. <u>Calibration</u>. All instruments were calibrated in accordance with manufacturers' instructions using National Institute of Standards and Testing traceable methods.
- c. <u>Methodology</u>. The survey consisted of the collection of indoor air quality and ventilation measurements; sampling surface dust, the air, and deteriorated paint for lead; observation of work practices and procedures; and employee interviews.

6. FINDINGS AND DISCUSSION.

- a. <u>Description of Operations</u>. There were no industrial operations. The Armory consisted of a drill hall, classroom, offices, and storage areas. There was a former indoor firing range (IFR) that was being used as a weight and exercise room and as a storage room for a tractor. The walls had been repainted and the ventilation system had been removed.
- b. <u>Occupational Safety and Health Programs</u>. There were no written occupational safety and health programs or records available in the Armory.
- c. <u>Building Condition</u>. The building was in good condition, except for areas of deteriorating paint.
 - d. Indoor Environmental Quality.

- (1) Heating, Ventilation, and Air-Conditioning Systems. The offices, kitchen, and classroom were served by a central heating and air conditioning system. Ventilation for the rest of the building was provided by operable windows.
- (2) Temperature and Humidity Control. The indoor temperatures of 78.9 degrees Fahrenheit (° F) in Room 117 (Caretaker's Office/SGT and 75° F in Room 105 (Manager's Office/SGT were within the ASHRAE recommended guidelines for an acceptable thermal environment of 73-79° F in the summer. The outdoor air temperature was 84° F. The relative humidity (RH) levels of 46.2 percent measured in room 117 and 46.1 percent in room 105 met the ASHRAE recommended guidelines of 30-60 percent RH. The outdoor RH was 72 percent.
- (3) Air Exchange Rate. The outdoor carbon dioxide measurement was 350 parts per million (ppm), slightly below the actual background of 380 ppm or more. To ensure occupant comfort, ASHRAE recommends that the carbon dioxide concentration in the room not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration. Therefore, the total carbon dioxide level should not exceed approximately 1,080 ppm. The indoor carbon dioxide levels of 500 ppm in room 117 and 482 ppm in room 105 were within the ASHRAE recommended guidelines in spite of the instrument readings being low.
- (4) Mold. No mold was observed. The observed high levels of RH were a potential source of moisture for mold growth. In case of future need, mold cleanup guidance is provided in Appendix F.
- e. <u>Water Quality</u>. The Armory was connected to a municipal water supply. No complaints or concerns were reported.
- f. <u>Lead Hazards</u>. Photographs of sampling locations are provided in Appendix C. Laboratory reports are in Appendix D.
- (1) Lead in air. Results were below the laboratory analytical detection limit as well as the OSHA 8-hour time-weighted average PEL of 50 milligrams per cubic meter (μ g/m³).
 - (2) Lead in surface dust.
- (a) Criteria. 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 developed for adult employees in the workplace and was adopted from OSHA Compliance Letter 02-02-58. Further information is provided in Appendix B.

(b) Results. Lead in dust wipe sample locations and analytical results are shown in the Table. Extremely high levels of lead in dust (up to $63,000~\mu g/ft^2$) were found in the former IFR and adjacent areas. Five of the results exceeded the NGB Region North Industrial Hygiene Office and USACHPPM recommended maximum level. These results also exceeded the EPA and State of Maryland lead exposure level. Personnel using the former IFR were potentially exposed to lead, and may have been tracking lead out of the area and into adjacent rooms. This could result in lead exposures for the general workforce and for children visiting this facility.

Wipe Sample #	Location of Samples	Conc. (µg/ft²)
QA W01	Former IFR baffle location	3,700
QA W02	Former IFR window sill/ventilation site	2,100
QA W03	Former IFR floor lanes	63,000
QA W04	Former IFR entrance area	530
QA W05	Locker room floor room 118	<110
QA W06	Supply room 104 on desk	610
QA W07	Supply room floor near back of room	<110
QA W08	Kitchen counter near pass thorough to classroom	<110
QA W09	Wall in dishwashing area near thermostat	<110

TABLE. Lead in Surface Dust Sampling Locations and Analytical Results.

- (c) Lead in Paint. The date of construction of the facility indicates that the use of lead-based paint was possible. Areas of deteriorated paint on the corridor wall leading to the former IFR and on the ceiling in the kitchen around the access panel were sampled. The results were 0.0097 percent and 0.0092 percent respectively, well below the EPA and State of Maryland definition for lead-based paint of 0.5 percent. However, deteriorating paint containing detectable lead may create dust lead hazards.
- g. <u>Asbestos</u>. Asbestos was not known to be present in the facility, and no potential asbestoscontaining materials were observed. No records of an asbestos survey were found.

- h. <u>Noise Dosimetry</u>. No operations with the potential to generate hazardous noise levels were identified.
- i. <u>Illumination</u>. All areas appeared to be adequately lit and occupants reported no areas of deficient lighting.
- j. <u>Safety</u>. As shown in Photograph 6, Appendix C, an extension cord across a corridor posed a trip hazard.
- 7. CONCLUSIONS. Significant health and safety concerns were: extremely high levels of lead in surface dust in the former IFR; small areas of deteriorating paint containing lead, which could generate dust lead hazards if not remedied; the lack of any record of an asbestos survey; and the lack of written occupational safety and health programs.

8. RECOMMENDATIONS.

- a. <u>Lead Exposure</u>. Health RAC 2.
- (1) Establish and execute a lead hazard management plan for all lead in the facility, and take immediate corrective action where a possible lead-related health hazard has been identified.
 - (2) Repair and stabilize all deteriorated paint in the Armory.
- (3) Clean all areas in and adjacent to the former IFR immediately, and clean other areas where sampling results showed elevated levels of lead. Follow the guidelines for cleaning in Appendix E. Ensure that cleaning is performed in compliance with the OSHA Lead in Construction Standard, 29 Code of Federal Regulations Part 1926.62 and National Guard Pamphlet 420-15.
- (4) If cleaning cannot be accomplished immediately, restrict access to the former IFR by keeping it locked. Post a sign warning against entry except in an emergency and against storing any material there. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. Address all potential lead hazards before extending this facility for use by children. If children will use this facility in the future, clean surfaces to the EPA and State of Maryland lead in dust standard for children under 6 years of age of $40 \,\mu\text{g/ft}^2$ on floors and clean all remaining areas to the NGB Region North Industrial Hygiene Office and USACHPPM decontamination level of $200 \,\mu\text{g/ft}^2$ for lead in dust on all other surfaces.
- b. <u>Asbestos Exposure</u>. No RAC can be assigned at this time. Perform an asbestos survey and take action on the results as required.

- c. Occupational Safety and Health Programs. Health RAC 4. Ensure that written programs are developed, implemented, and maintained.
 - d. Safety. Safety RAC 4. Eliminate trip hazards such as extension cords.
- 9. ADDITIONAL ASSISTANCE. For additional assistance, or questions concerning this report, please contact the undersigned at DSN 584-3118, commercial 410-436-3118, or electronic mail: Non-Responsive Ous.army.mil



Industrial Hygienist Industrial Hygiene Field Services Program

APPROVED:

Non-Responsive

MAJ, MS Program Manager Industrial Hygiene Field Services Program

APPENDIX A

REFERENCES

- 1. Occupational Safety and Health Administration, Title 29, Code of Federal Regulations (CFR), Parts 1910 and 1926, current ed. http://www.osha.gov/comp-links.html
- 2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 62.1-2004, Ventilation for Acceptable Indoor Air Quality. http://www.ashrae.org
- 3. EPA 40 CFR Part 745, Lead; Identification of Dangerous Levels of Lead; Final Rule, 5 Jan 01.
- 4. Department of Defense Instruction (DODI) 6055.1, Department of Defense Safety and Occupational Health (SOH) Program, 19 Aug 98. http://www.dtic.mil/whs/directives/corres/pdf/i60551 081998/i60551p.pdf
- 5. NG Pam 420-15, Facilities Engineering, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.

Page 4419 of 5269

APPENDIX B

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 μ g/ft²) and windowsills (250 μ g/ft²) 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 $200 \,\mu\text{g/ft}^2$ 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 $200 \,\mu\text{g/ft}^2$ 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.

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- 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 μ g/ft² on floors and 250 μ g/ft² 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 in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m³ 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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MDARNG Industrial Hygiene Baseline Survey, COL Victor P. Gillespe Armory, Queen Anne, MD, Report No. 55-ML-01ED-03/07, 26 August 2003

APPENDIX C

TABLE C-1. Photographs of Wipe Sampling Locations.

Photograph Number	Location
1	Former IFR baffle location
2	Former IFR window sill/ventilation site
3	Former IFR entrance area
4	Former IFR floor lanes
5	Locker Room 118 floor
6	Supply Room floor near back of room
7	Kitchen counter near passthrough to Classroom
8	Wall in Dishwashing area near thermostat
9	Corridor wall leading to former IFR (paint)
10	Kitchen ceiling around access panel (paint)



Photograph 1.



Photograph 2.



Photograph 3.



Photograph 4.

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Photograph 5.



Photograph 6.



Photograph 7.



Photograph 8.



Photograph 9.



Photograph 10.

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APPENDIX D

LABORATORY REPORTS



CERTIFICATE OF ANALYSIS

Julian and

nalytical Services, Inc.

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Havre de Grace, Maryland 21078 State Military Reservation 301-IH Old Bay Lane, Attn: NGB-AVN-SI, National Guard Bureau P.O. Number: Job Number: Job Location: Job Name: Not Provided Not Provided Not Provided Not Provided

Address:

Attention:

Report Date: Person Submitting: Date Analyzed: Chain Of Custody: 09/09/2003 16952

09-Sep-03

Summary of Atomic Absorption Analysis for Lead

Number	Number Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft*)	Reporting Limit	Final Result	Comments
-			Commence of the commence of th	100000000000000000000000000000000000000	The second secon			
0366784	QA Blank 01	Flame	Wipe Blank	***	N/A	- 11		
0366785	QA Wipe 01	Flame	Wine	***	0.100		< 12 ug	
0366786	OA W02	Flams	Wind	•	0.100			
7073360	2	1 1811	wipe	***	0.108			
0.00707	(A #05	riame	Wipe	*	0.108			
0366788	QA W04	Flame	Wipe	***	0 100		-	
0366789	QA W05	Flame	Wine	:	0.100			
0366790	QA Blank 02	Flame	Wipe Blank	***	N/A			
0366791	QA W06	Flame	Wipc	:	9010			
0366792	QA W07	Flame	Wipe	***	8010			
0366793	QA W08	Flame	Wipe	**	9010			
0366794	QA W09	Flame	Wipe	***	0 108			
0366795	QA Bulk 01	Flame	Paint Chip	***	N/A	11/32 Ug/IT-	< 110 ug/ft ²	
0366796	QA Bulk 02	Flame	Paint Chip	****	N/A			

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition that it is not to be used, in whose or in protection to clients, the public and these Laboratories of firm us. Sample types, locations and collection protocob are based upon the information provided by the persons submitting them and, unless collected by and unless collected by the persons submitting them and, unless collected by the persons submitting to the persons submitting them and, unless collected by the persons submitting them and the persons submitting them and the persons submitted by the persons submitted 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. NYLAP Accreditation 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 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

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CERTIFICATE OF ANALYSIS

Address: Client: Havre de Grace, Maryland 21078 State Military Reservation 301-JH Old Bay Lane, Atm: NGB-AVN-SI, National Guard Bureau Job Number: Jeb Lecation: Joh Name: Not Provided Not Provided

Not Provided

P.O. Number:

Not Provided

Chain Of Custody:

Date Analyzed:

09/09/2003 116952

Report Date: Person Submitting

09-Sep-03

Summary of Atomic Absorption Analysis for Lead

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B Client Sample Number Analysis Type Sample Type Air Volume Area Wiped Reporting Limit Final Result Comments

AMA Sample Number

Attention:

%Pb = percent lead by weight N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm) ug = micrograms ug/L = parts per billion (ppb)

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

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

Analyst: (Jod Willoughby

Technical Manager:

G Edward Carney

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APPENDIX E

LEAD CLEANING GUIDANCE





CHAPTER 14: CLEANING

Ste	ep-by-Step Summary	14–3
I.	Introduction	14–5
	A. Performance Standard	14–5
	B. Small Dust Particles	14–5
	C. Difficulties in Cleaning	14–5
	Low Clearance Standards	14–5
	2. Worker Inexperience	14–6
	3. High Dust-Producing Methods and/or Inadequate Containment	14–6
	4. Deadlines	14–6
II.	Coordination of Cleaning Activities	14–6
	A. Checklist	14–6
	B. Equipment Needed for Cleaning	14–6
	C. Waste Disposal	14–7
III.	Cleaning Methods and Procedures	14–7
	A. Containment	14–7
	B. Basic Cleaning Methods: Wet Wash and Vacuum	
	Cleaning Techniques	
	1. HEPA Vacuuming	
	2. Wet-Detergent Wash	
	3. The HEPA/Wet Wash/HEPA Cycle	
	4. Sealing Floors	14–16
IV.	Order of Cleaning Procedures During Lead Hazard Contr	
	A. Precleaning Procedures	14–16
	B. Ongoing Cleaning During the Job	14–18
	C. Daily Cleaning Procedures	14–18
	1. Large Debris	14–18
	2. Small Debris	14–18
	3. Exterior Cleaning	14–18
	4. Worker Protection Measures	14–19
	5. Maintaining Containment	14–19



Chapter 14: Cleaning



V.		der of Final Cleaning Procedures After	
	Lea	ad Hazard Control	14–19
	A.	Final Cleaning	14–19
		1. Decontamination of Workers, Supplies, and Equipment	14–19
	B.	Preliminary Visual Examination	14-20
	C.	Surface Painting or Sealing of Nonfloor Surfaces	14-20
	D.	Final Inspection	14-20
	E.	Recleaning After Clearance Failure	14–20
VI.	Cle	eaning Cost Considerations	14–21
	A.	Initial Clearance Test Failure Rates	14-21
	B.	Key Factors In Effective Cleaning	14-21
	C.	Special Problems	14–21
VII	. A	Iternative Methods	14–22
	A.	Vacuums	14-22
	B.	Trisodium Phosphate and Other Detergents	14-22



Step-by-Step Summary



Cleaning: How To Do It

- 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.
- 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.
- For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
- 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.
- 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.



-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.

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6-mil polyethylene sheeting (or equivalent).

May, 2018





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.

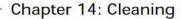
1. Low Clearance Standards

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 μg/ft² on floors.
- 500 µg/ft² on interior window sills (stools).
- 800 μg/ft² on window troughs (the area where the sash sits when closed).
- 800 μg/ft² 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.







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.

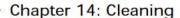
Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and triso-dium 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 finedust 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.

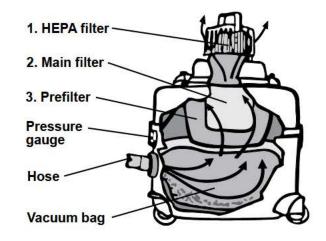
Emptying the HEPA Vacuum

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 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 highphosphate 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



Pressure gauge

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 wetwash 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. EMERGENCY EYE WASH STATION Latex Neoprene Nitrile

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:

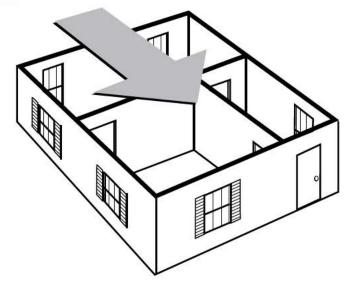
First, the area is HEPA vacuumed.



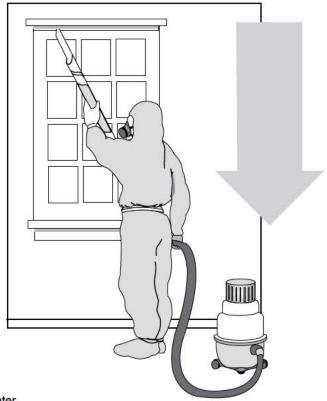


Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

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



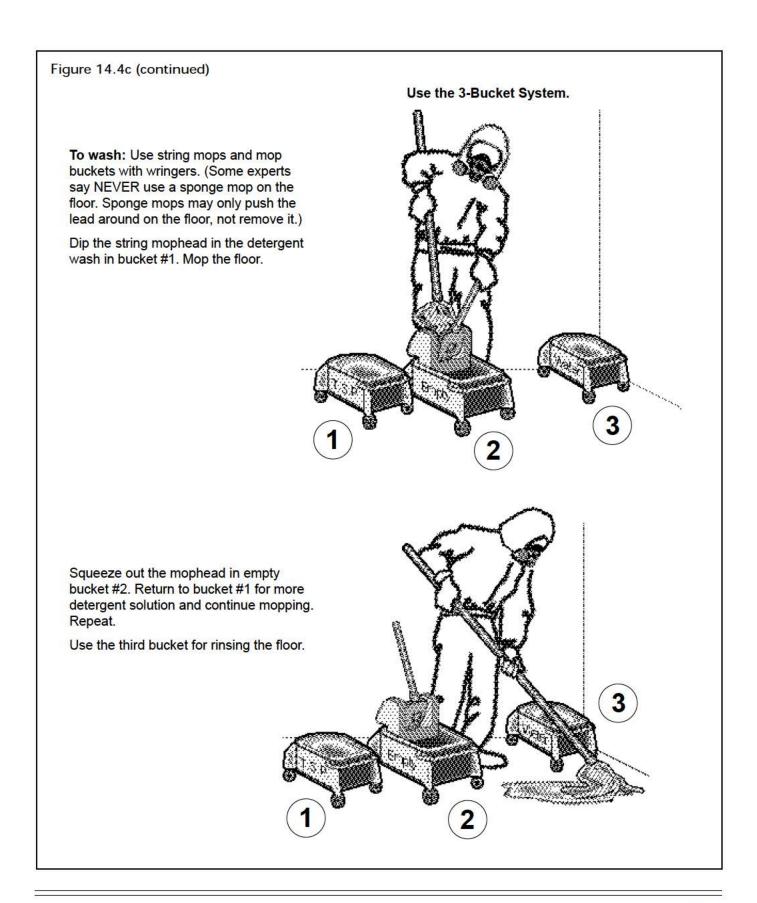


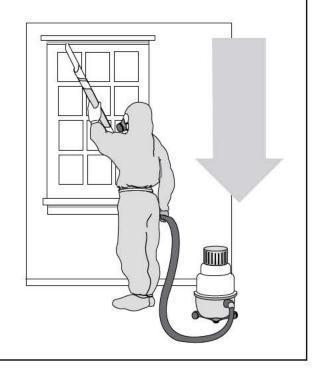




Figure 14.4d (continued)

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

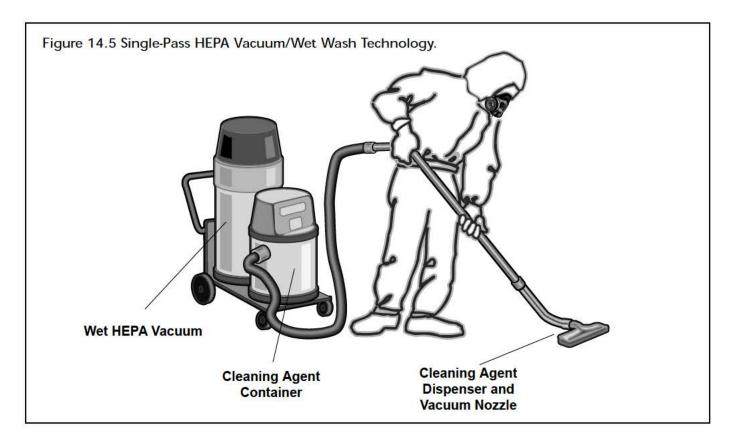
The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

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







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



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

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





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 dustretaining 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

	Mass Removal Efficiency Percentages Cleaning Method					
Cycle Number						
	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 Industrial Hygiene Baseline Survey, COL Victor P. Gillespe Armory, Queen Anne, MD, Report No. 55-ML-01ED-03/07, 26 August 2003

APPENDIX F

MOLD CLEANING GUIDANCE

Army Facilities Management Information Document on Mold Remediation Issues

TG 277 FEBRUARY 2002



ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

INTRODUCTION	2
MOLD PREVENTION TIPS	3
REMEDIATION PLANNING	3
REMEDIATE MOISTURE AND MOLD PROBLEMS	3
REMEDIATION PROCEDURES	4
FOUR REMEDIATION LEVELS	4
HAZARD COMMUNICATION	9
CONCLUSION	10
REFERENCES	10
APPENDIX A: WATER DAMAGE CLEANUP AND MOLD PREVENTION	11
APPENDIX B: MOLD REMEDIATION GUIDELINES	14
APPENDIX C: PERSONAL PROTECTIVE GUIDANCE	17
APPENDIX D: CONTAINMENT GUIDANCE	19

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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.

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Feb 02

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.

TG 277

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 ft²) follow Level I guidance for PPE and containment and for a areas (>10 ft²) follow Medium (Level II) or when greater than 100 ft² 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.
- 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.			

TG 277 \longrightarrow Feb 02

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 (ft²)					
Books and papers	3				
Carpet and backing	1, 3				
Concrete or cinder block	1, 3	Minimum N-95 respirator, gloves, and goggles			
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3				
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		None required		
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				
Carpet and backing	1,3,4				
Concrete or cinder block	1,3				
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	Limited or Full Use professional judgment, consider	Limited Use professional judgment, consider		
Non-porous, hard surfaces (plastics, metals)	1,2,3	potential for remediator exposure and size of contaminated area	potential for remediator/occupant exposure and size of contaminated area		
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				
Carpet and backing	1,3,4				
Concrete or cinder block	1,3	Full	Full		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider potential for remediator/occupant exposure	Use professional judgment, consider potential for remediator exposure and		
Non-porous, hard surfaces (plastics, metals)	1,2,3	and size of contaminated area	size of contaminated area		
Upholstered furniture & drapes	1,2,4				
Wallboard (drywall and gypsum board)	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.

Wood surfaces

1,2,3,4

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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)

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Feb 02

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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TG 277 ### Feb 02

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 (ft²) 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

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Feb 02

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 ft² 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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TG 277

February 2002

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278 February 2002



Table of Contents

Introduction	2
Safety Tips While Investigating And Evaluating Mold And Moisture Problems	2
Communicate With Building Occupants At All Stages Of Process, As Appropriate.	3
Routine Investigation And Evaluation Of Moisture And Mold Problems	3
Assessments Requiring Sampling	3
References	4
APPENDIX A: Mold Investigation Decision Logic	5
APPENDIX B: Mold Remediation Guidelines	8
APPENDIX C: Personal Protective Equipment	11
APPENDIX D: Containment Guidance	13

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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 contamination².

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

- 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 appropriate¹.

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 problems³.

- 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 contamination².

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 air⁴. 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 Control⁴."

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.

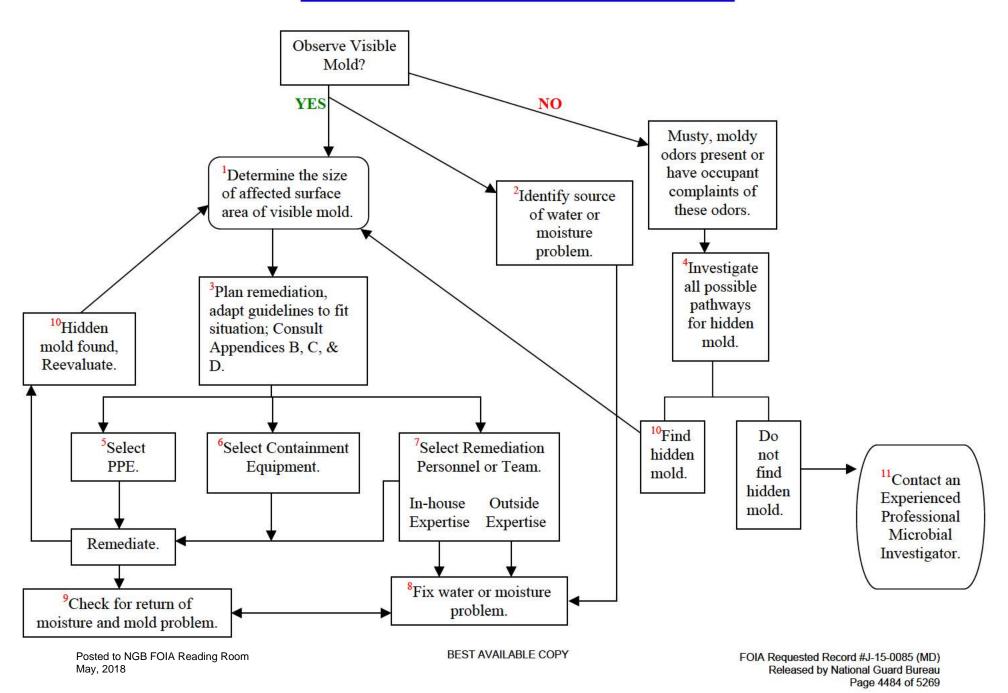
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- 7. Occupational Safety & Health Administration. *Respiratory Protection Standard*, 29 *Code of Federal Regulations 1910.134*. 63 FR 1152. January 8, 1998.
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APPENDIX A

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 activities³. 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.

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		None required				
Carpet and backing	1, 3						
Concrete or cinder block	1, 3	_					
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3	Minimum					
Non-porous, hard surfaces (plastics, metals)	1, 2, 3	N-95 respirator, gloves, and goggles					
Upholstered furniture & drapes	1, 3						
Wallboard (drywall and gypsum board)	3						
Wood surfaces	1, 2, 3						
	MEDIUM - 7	Total Surface Area Affected Between 10 and	100 ft ²				
Books and papers	3	_					
Carpet and backing	1,3,4						
Concrete or cinder block	1,3						
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	Limited or Full Use professional judgment, consider	Limited Use professional judgment, consider				
Non-porous, hard surfaces (plastics, metals)	1,2,3	potential for remediator exposure and size of contaminated area	potential for remediator/occupant exposure and size of contaminated are				
Upholstered furniture & drapes	1,3,4						
Wallboard (drywall and gypsum board)	3,4						
Wood surfaces	1,2,3						
		rface Area Affected Greater Than 100 ft ² or ediator Exposure During Remediation Esti					
Books and papers	3						
Carpet and backing	1,3,4	7					
Concrete or cinder block	1,3	Full	Full				
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider potential for remediator/occupant exposure	Use professional judgment, consider potential for remediator exposure and si				
Non-porous, hard surfaces (plastics, metals)	1,2,3	and size of contaminated area	of contaminated area				
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).

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Page 4490 of 5269

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 (ft²) 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 ft² 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 Queen Anne Armory 3011 Star Road Queen Anne, MD 21657

Prepared For:

National Guard Bureau Region North IH

301-IH Old Bay Lane

Havre de Grace, MD 21078

Survey Location:

Queen Anne Armory

3011 Star Road

Queen Anne, MD 21657

Prepared By:

Analytical Laboratory Services, Inc.

3544 North Progress Avenue

Suite 100

Harrisburg, PA 17110

Survey Date:

September 16, 2010

Report Date:

October 26, 2010

ALSI Project #:

1009598

Non-Responsive

Director, Environmental Health & Safety

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Table of Contents Section 1.0 Executive Summary 3 Section 2.0 Operation Description & Observations 4 Section 3.0 Noise Survey 5 Section 4.0 Lead Testing 6 Section 5.0 Lighting 8 Section 6.0 Indoor Air Quality 9 Section 7.0 Suspect Asbestos Containing Building Materials 11 Section 8.0 Maintenance Bay 12 Section 9.0 Limitations 13 Appendix A. Laboratory Analysis Report 14 Appendix B. Photographs 15 Appendix C. Floor Plan 16 Appendix D. References 17

Section 1.0 Executive Summary

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on September 16, 2010, at the Queen Anne Armory located at 3011 Star Road, MD 21657. The survey was performed by Ms. Non-Responsive and Mr. Non-Responsive

- 1. Lead surface and air samples were collected. All sample results were less than recommended guidelines or regulatory standards. Deteriorated paint was observed in some locations throughout the facility. Peeling and damaged paint should be repaired and properly remediated.
- 2. Lighting levels met the minimum recommended guidelines in all but the following areas: 1) Room 115 Converted Firing Range 2) Drill Hall. Lighting should be improved in these areas.
- 3. Relative humidity exceeded the recommended ceiling of 60% in some locations. Some doors and windows were open at the time of this survey. 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 in some areas. Water damage is present on some block walls. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.
- 5. Supply and 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.

Section 2.0 Operation Description & Observations

Section 2.0 Operation Description & Observations

The Queen Anne Armory is mainly an administrative facility with many offices, training and storage areas. There were approximately fifteen full-time employees stationed at this facility at the time of this survey.

The building was constructed in 1976. The exterior is brick. The interior has cement block walls, concrete floors and vinyl floor tile.

There is a central heating, ventilating, and air conditioning (HVAC) system present. There are three air handlers. Outdoor air ventilation occurs via the HVAC system. Some doors and windows were open on the day of this survey. A limited inspection of the HVAC system was performed. The units could not be opened for inspection. Portions of the units that could be observed were clean and appeared in good condition with the exception of damaged fiberglass insulation observed in the boiler room. Filters are reportedly replaced and the units inspected every six months. The damaged fiberglass insulation should be removed and replaced.

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 storage 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.

Section 3.0 Noise Survey

Section 3.0 Noise Survey

Employees were not performing tasks that provided excessive noise levels. Therefore, noise exposure monitoring was not conducted.

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 an office 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/m²	Surface ug/ft ²	Paint Chip %Pb
1	Drill Hall	<4.3		
2	Room 111	<4.2		
3	Blank	<3 (ug)		
4	Converted Firing Range - Floor		<110	
5	Converted Firing Range Weight Seat		! <110	
6	Converted Firing Range - Top of Bench		<110	:
7	Floor Outside Converted Firing Range		<110	
8	Drill Hall - Floor (Center)		<:10	İ
9	Drill Hall – Top of Vending Machine		<110	1
10	Drill Hall Tabletop		<1 0	
11	Room 118 Men's Locker Room, Top of Locker		<110	
12	Kitchen Countertop by Microwave		<110	
13	Down 11 Supply Word		<110	
14	Room 113 - Top of Desk		<110	
15	Entry Lobby Floor		<110	
16	Blank		<12 (ug)	
Criteria		50	200	0.5

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)

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/ft² 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

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Medicine (USACHPPM) has determined that 200 ug/ft² 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/ft² on floors and 250 ug/ft² 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/m³. In fact, no detectable level of lead was identified in the air samples collected.

There is an area of the building that was previously a firing range. It has been fully abated and is now a storage area.

Deteriorated paint was observed in some locations throughout the facility. The most notable areas were the Drill Hall ceiling and the Lobby ceiling. Peeling and damaged paint should be repaired and properly remediated.

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 III	199.2	30-50	Yes
Room 113	200.6	30-50	No
Rootn II	101.7	30-50	Yes
Kitchen	97.1	50	Yes
Locker Room 118	17.5	7	Yes
Room 117	81.3	30-50	Yes
Room 115 Converted Firing Range	28.3	30-50	No
Drill Hall	28.8	30-50	, No

Lighting levels met the minimum recommended guidelines in all but the following areas:
1) Room 115 -- Converted Firing Range 2) Drill Hall. Lighting should be improved in these areas.

Section 6.0 Indoor Air Quality

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 72.7 to 77.0 degrees F with relative humidity readings ranging from 50.6% to 72.1%. During the survey, carbon dioxide (CO_2) levels ranged from 373 ppm to 419 ppm within the facility compared to an outdoor CO_2 level of 372 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,072 ppm (372 ppm \pm 700 ppm). Carbon monoxide (CO_2) ranged from 0.0 \pm 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	79.3	72.7	380	0.4
Room 111	72.7	50.6	419	0,2
Room 113	73.8	66.2	401	0.5
Room 11	73.0	56.4	410	0.3
Kitchen	73.4	67.2	416	0.1
Locker Room 118	77.0	68.5	409	0.1
Room 117	76.5	68,5	408	0.2
Room 115 Converted Firing Range	74.8	71.2	381	0.4
Drill Hall	74.3	72.1	373	0.1
Outdoors	77.7	71.6	363	0.0
Criteria	73.0-79.0	30-60	<1,072	<9.0

Key: Bolded results exceed listed criteria

Relative humidity exceeded the recommended ceiling of 60% in many locations. Temperature was within the recommended criteria of 73 - 79 degrees F in all locations.

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There is a central HVAC system in the building. Air-conditioning was on in the offices and many windows and doors were open. Outdoor conditions were hot and humid. Indoor 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 1,072 ppm. This suggests that outdoor air ventilation is adequate in this area. There is a mechanical ventilation system for some areas of this facility which provides outdoor air ventilation.

Carbon monoxide levels were less than the recommended guideline 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. Water damaged ceilings and roof leaks are present in some areas. Active roof leaks were reported in the Drill Hall and Lobby. Efflorescence was observed on some block walls suggesting water infiltration is present. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.
- 2. There is standing water present on the floor of the boiler room. Drains should be repaired to properly removed water.
- 3. Supply and 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.

Suspect Asbestos Containing Building Materials

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 following are the most notable findings regarding suspect ACM at the time of this survey:

- 1. Window glazing on the exterior of the building is damaged and in poor condition in some locations. This is a possible ACM.
- 2. 12" x 12" floor tile were observed in some areas of the facility. They were in good condition.

Section 8.0 Maintenance Bay

Section 8.0 Maintenance Bay

There is no garage area at this facility.

Section 9.0 Limitations

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.

Appendix A Laboratory Analysis Report



AIHALAR LIC

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and Analytical Services, Inc.

A Specialized Environmental Laboratory

P.O. Number: Job Lacaffons Job Number: Job Name: 301-IH Old Bay Lane, Affin NOB-AVN-SI, Havre de Grace, Maryland 21078 State Military Reservation National Cuand Bureau

9/27/2010 9/20/2010 508810 Chain Of Custody: Person Submitting: Date Submitted Date Analyzed: W912K6-09-A-0003 Queen Anne, MD Not Provided Queen Anne

Page 1 of 2

9/27/2010

Report Date:

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Cheat Sample Number	Analysis Type	Sample Type.	Air Volume (E)	Area Wiped (ft)	Kep L	Reporting Limit	Totalug	Final Result	ii.	Comments
1080649	1009598-1	Flanse	Air	592	NA	63	,m/gn	V	<4.3	ug/m²	
1080650	1009598-2	Flame	Air	718	MA	4.2	मई/मा	δ.	<4.2	, us/an	
1080651	1009598-3	Flume	Air Blank	Ó	NA	₹Ď.	пуп		V	e e	
1080652	1069598-4	Flanse	Wipe	・春年休中	0.108	110	ug/fta	<12	<110	ng/R?	
1080653	1009598-5	Figure	Wile	**	801.0	110	ng/il²	×	<110	ng/R	
159080I	1009598-6	Flanse	Wipe	· · · · · · · · · · · · · · · · · · ·	0.108	110	ug/ft²	<12		ug/A²	
1080655	£-\$656001	Flume	Wipe	**	0.108	110	ug/fF	<12		11g/ff ²	
1080656	3-8656001	Flame	Wipe	· · · · · · · · · · · · · · · · · · ·	0.108	110	ug/H²	<12		ug/fit	
1080657	6-8656001	Flane	Wipe	***	0.108	110	ug/ft²	<15.	01 I>	ng/fr	
1089658	1009598-10	Flame	Wipe	ችች » ት	0.108	110	ug/ff²	<12	0110	ug/ff?	
1080659	1.009598-11	Flame	Wipe	春寒如卷.	6.108	110	ng/il-	C)	01T>	ug/fit	
1080660	f009598-12	Flame	Wipe	8 % % % % % % % % % % % % % % % % % % %	0.108	110	ug/III²	<12	<110	ng/fir	
1980661	1009598-13	Flant	Wipe	****	0.108	110	ug/fit	<12	O(1)>	ug/II-	
1080662	1009598-14	Flanc	Wipe	安格的女	0.108	110	ug/ff?	<12	<110	ug/f)?	
1080663	51-8656001	Flame	Wipe	***	0.108	110	High	<12	<110	ng/ff²	
1080664	1009598-16	Flame	Wine	多数方面	N/A	Ç	98	<12	S. P.	ă E	

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 of these Laboratories we expressly discluding provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly discluding any knowledge and liability for the accuracy and completely used. this information. Residual sample materials will be discordance with the appropriate regulatory guidelines, unless otherwise requested by the citient average accordance with the appropriate regulatory guidelines, unless otherwise the citient and the samples. This regard must not be used to chain, and does not imply product certification, approved, or endorsement by NY ELAP, AlHA, NYLAP, NISF, or any agency of the Federal Government. All rights reserved, AMA Analytical Services, Inc. This export applies only to the samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a number to clients, the public, and these Laboratories, this report is

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An AIHA (#198470), WWLAP (101143-D), and NY ELAP (#10920) Accredited Laboratory

Address: Client

Attentions

and anolytical Services, Inc.



A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS



9/20/2010

Date Submitteil:

Queen Anne, MD

Job Lacation:

301-IH Old Bay Lane, Attn: NGB-AVN-SI,

National Guard Bureau

State Military Reservation

Havre de Grace, Maryland 21078

Attention:

Ducen Ame

Job Names

508810

Chain Of Custody:

9/27/2010

Report Date:

9/27/2010

Person Submitting:

Date Analyzed:

W12K6-09-A-0003

P.O. Number: Joh Number:

Not Provided

Page 2 of 2

Comments

Summary of Atomic Absorption Analysis for Lead

See QC Summary for analytical results of quality control samples Final Result Total ug

Reporting Limit

Area Wiped

Air Voinne 3

Sample Type

Aunlysis Type

Client Sample Number

AMA Sample

Number

associated with these sampes. NY ELAP accreditation applies only to paint chip, wipe, and soil

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

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Soilds: EPA 600/R-93/200(M)-7421; Water: SM-3113B mg/L = parts per million (ppm) mg/Kg = parts per million (ppm) on a dry weight basis MA = Not Applicable

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 ug = micrograms %Pb = percent lead on a dry weight basis

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.

should not be considered when interpreting the result.

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

Pechnical Manager:

G Edward Camey

submitted and accepted for the elicusts were of the elicust to whom it is addressed and upon the vondition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written from its addressed and in the information provided by the pursons submitting them and, unless collected by personned of these Laboratories, we expressly disclaim any knowledge and labifity for the accuracy and completeness of Mikirler mairan. Residial sample insternal will be discarded in accordance will be appropriate regulatory guidelines, unless otherwise requested by the clear. NVLAP accreditation applies only to plantice light microscopy of MERA set samples. This report must not be used to claim, and does not imply product certification, approval, or endowschem by NY ELAP, AFIA, NVLAP, NIST, or any agency of the Foderal Government. All rights reserved. AMA Analysical Services, Inc.

Aderess:

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C Pe SeilfSolid
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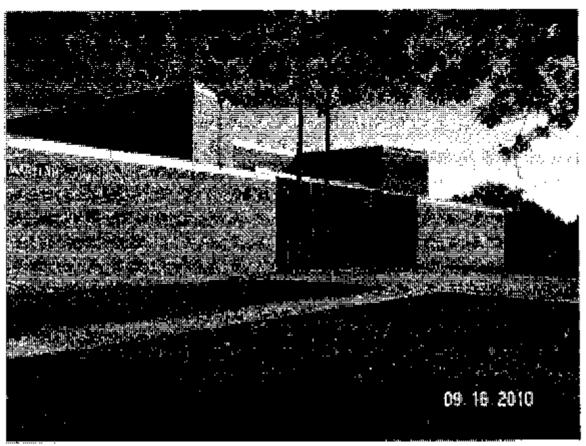
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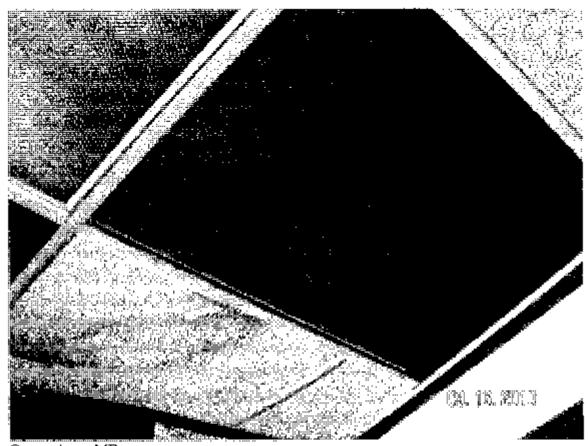
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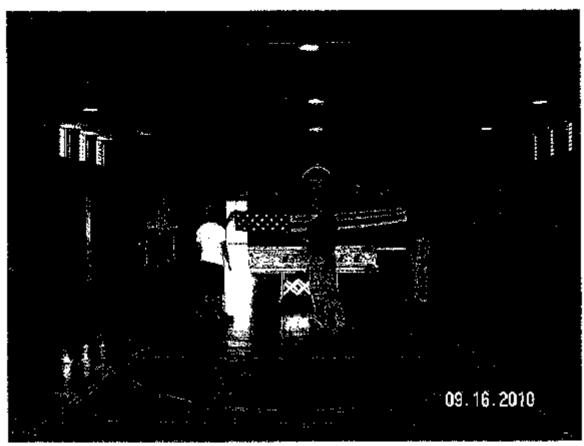
Appendix B Photographs



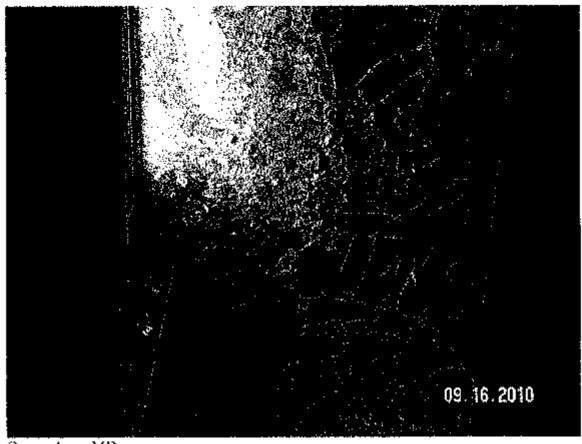
Queen Anne MD Exterior



Queen Anne MD
Entry Lobby Ceiling – Water Damage, Chipping /Peeling Paint and Missing Ceiling Tiles from Roof Leak



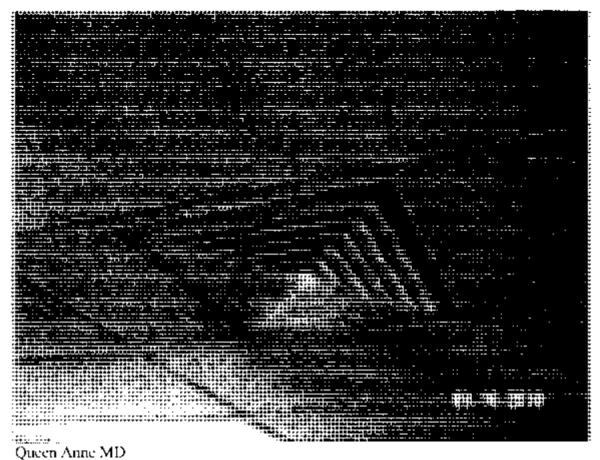
Queen Anne MD Drill Hall



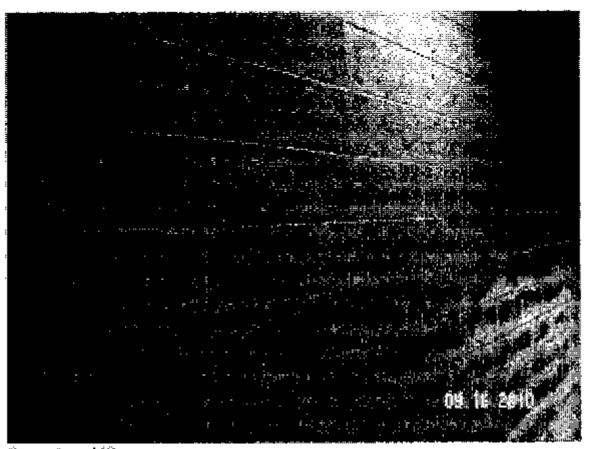
Queen Anne MD Drill Hall -- Water Damage and Chipping/Peeling Paint on Block Wall



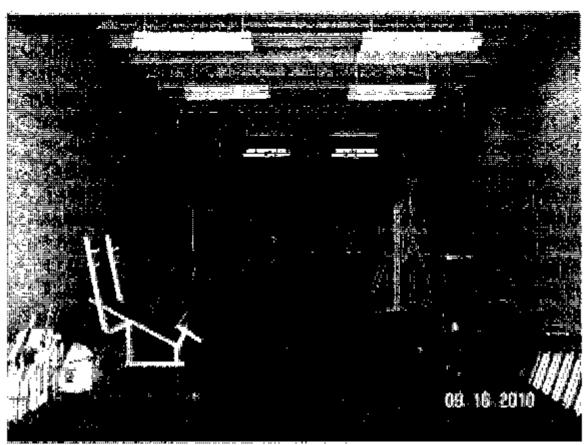
Drill Hall - Water Damage and Efflorescence on Block Wall



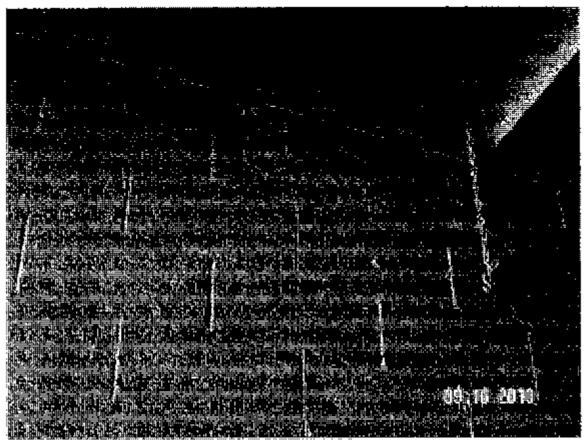
Room 111 Water Damage/Possible Fungal Growth on Ceiling Tile and Supply Vent



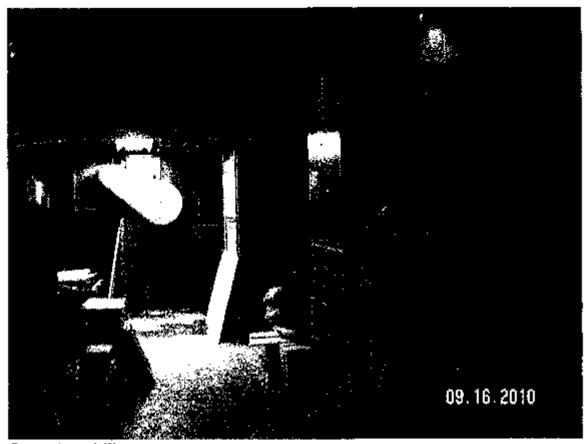
Queen Arms MD Hallway to Converted Firing Range - Efflorescence on Cement Block Wall



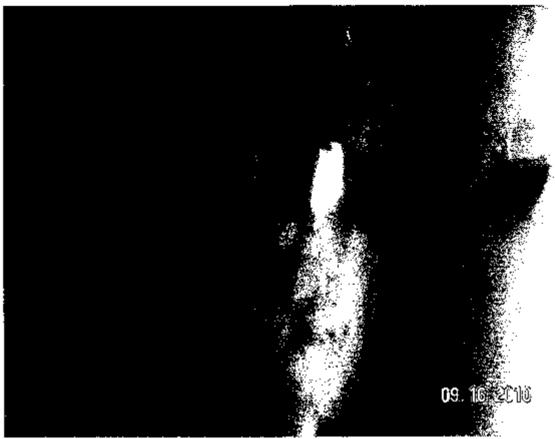
Queen Anne MD Converted Firing Range



Queen Anne MD Converted Firing Range - Rust Staining and Efflorescence On Cement Block Wall



Queen Anne MD Boiler and AHUs

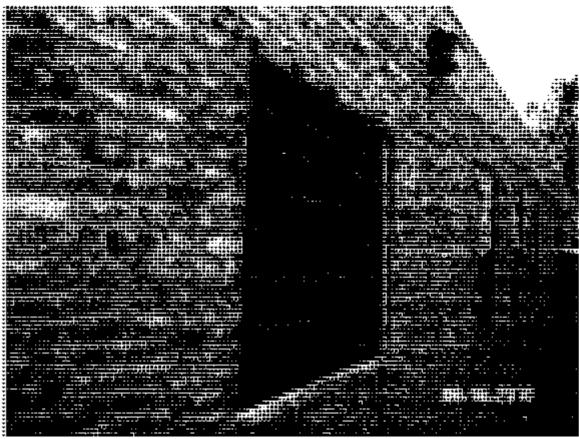


Queen Anne MD

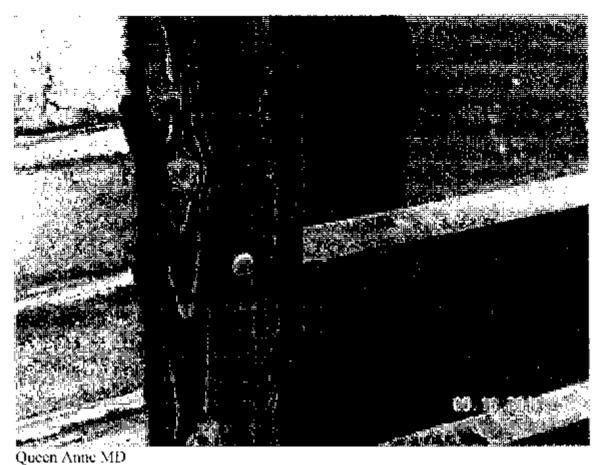
Boiler Room - Damage Fiberglass Pipe Insulation



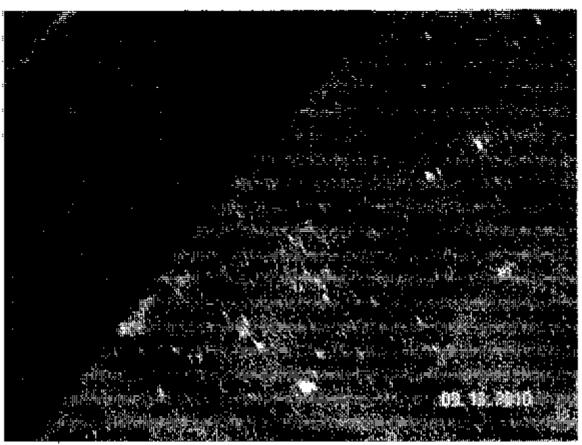
Queen Anne अपि Boiler Room Standing/Rusty Water on Floor



Queen Anne MD Exterior – Fresh Air Intake



Exterior – Possible Asbestos Containing Material – Window Glazing



Queen Anne MD Drill Hall Floor – Visible Powder and Paint Falling from Ceiling from Roof Leak

Appendix C Floor Plan

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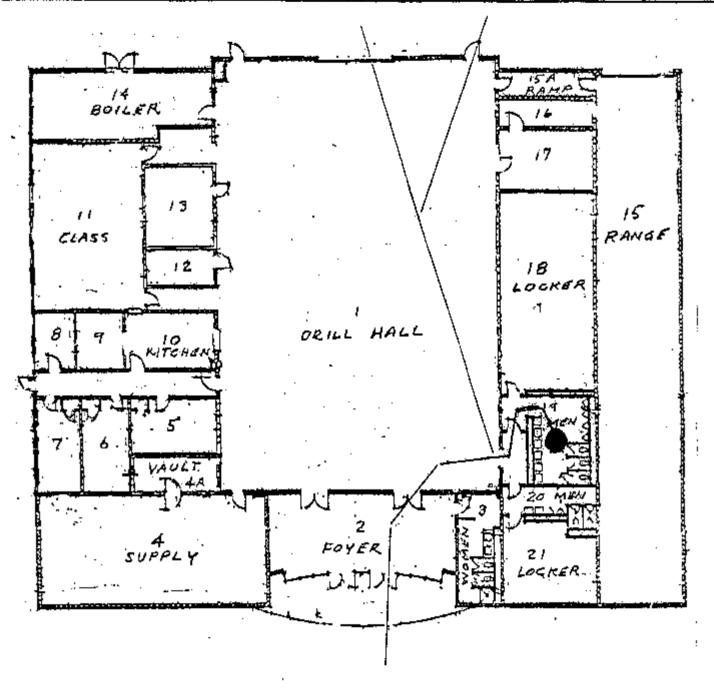
INSPADEATION AND LOCATION

DUCEN ANNE

PROJECT TITLE

5. PROJECT NUMBER

FIRE ESCAPE ROUTE



FIRST FLOOR LEVEL

ENLISTED MENS LATRINE AREAIG

Appendix D References

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 (ACGIII) 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
- 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



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 Queen Anne Readiness Center

Prepared For: National Guard Bureau Region North IH

301-IH Old Bay Lane

Havre de Grace, MD 21078

Survey Location: Queen Anne Readiness Center

3011 Starr Road

Queen Anne, MD 21657

Prepared By: Compliance Management International, Inc.

1215 Manor Drive

Suite 205

Mechanicsburg, PA 17055

Survey Date: October 2, 2013

Report Date: November 20, 2013



Manager, Industrial Hygiene Services

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Table of Contents

Section 1.0 Executive Summary	3
Section 2.0 Operation Description & Observations	4
Section 3.0 Lead Testing	5
Section 4.0 Lighting	7
Section 5.0 Indoor Air Quality	8
Section 6.0 Suspect Asbestos Containing Building Materials	10
Section 7.0 Equipment	11
Section 8.0 Limitations	12
Appendix A. Laboratory Analysis Report	13
Appendix B. Photographs	14
Appendix C. Floor Plan	15
Appendix D. References	16

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on October 2, 2013, at the Queen Anne Readiness Center located at 3011 Starr Road, Queen Anne, MD 21657. The survey was performed by Mr. Non-Responsive.

- 1. Surface levels of lead exceed the recommended guideline of <200 ug/ft² at four locations in the converted firing range and the top of the cabinet in Office 112.
- 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 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 two occupied areas 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 (CO₂) 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 damaged ceiling was observed in the Kitchen. In several other areas, ceiling tiles were missing where water damage was reported to have occurred.

Section 2.0 Operation Description & Observations

The Queen Anne Readiness Center is mainly an administrative facility with a drill hall, offices, and classrooms. There were no full-time employees stationed at this facility at the time of this survey. There is no maintenance personnel assigned to the building.

The building is reported to have been built in 1973. It is a single story structure. The exterior is brick and block. The interior walls are block and brick. The floors are concrete, 12"x12" floor tiles, and carpet.

The heating system is an oil-fired hot water unit. There is no air conditioning 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 contains a converted firing range being used as a storage area and gym.

No suspect asbestos containing material (ACM) was observed at the time of this survey.

Chipped and peeling paint were observed in the hallway to the converted firing range.

Housekeeping is adequate.

It was reported that the building has several roof leaks.

Water damaged ceiling was observed in the Kitchen. In several other areas, ceiling tiles were missing where water damage was reported to have occurred.

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/m³	Surface ug/ft ²	Bulk %
1	Office 113	<6.1	*	*
2	Assembly Hall	<6.1	*	*
3	Blank	3	*	*
4	Blank	*	12	*
5	Assembly Hall – Floor	*	<110	*
6	Kitchen – Top of Refrigerator	*	<110	*
7	Office 113 – Top of Cabinet	*	<110	*
8	Locker Room – Top of Locker	*	<110	*
9	Floor Outside of Converted Firing Range Door	*	<110	*
10	Converted Firing Range – Floor at Bullet Trap End	*	6900	*
11	Converted Firing Range – Top of Light Fixture	*	470	*
12	Converted Firing Range – Top of Cabinet	*	290	*
13	Converted Firing Range – Floor	*	230	*
14	Office 112 – Top of Cabinet	*	250	*
15	Break Room – Top of Bookshelf	*	<110	*
16	Converted Firing Range – Wall	*	*	< 0.0094
-	Criteria	50	200	0.5

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:

- 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/ft²) 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/ft² on floors and 250 ug/ft² 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.

- Surface levels of lead exceed the recommended guideline of <200 ug/ft² at four locations in the converted firing range and the top of the cabinet in Office 112.
- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m³).

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
Boiler Room	26.9	30	No
Assembly Hall	24.4	10	Yes
Lounge/Classroom 111	51.7	30-50	Yes
Corridor	23.6	5	Yes
Office 105	56.2	30-50	Yes
Office 106	54.3	30-50	Yes
Kitchen-Food Prep	81.5	50	Yes
Office 112	14.2	30-50	No
Office 113	103.2	30-50	Yes
Gym	43.7	30	Yes
Storage Room-Bulk	26.2	10	Yes
Lobby	261.5	10	Yes
Women's Latrine	69.2	5	Yes
Locker Room	65.1	7	Yes
Men's Latrine	13.6	5	Yes
Storage Room-Bulk	21.1	10	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 Boiler Room and Office 112.

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 #39018). The IAQ Meter was last calibrated in March 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.

IAO Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	77.3	62.9	358	0.4
Office 113	78.2	61.1	584	0.4
Gym	75.2	61.7	440	1.2
Criteria	68-79	30-60	<1,058	<9

Table Notes:

- 1. **Bolded** results exceed listed criteria
- 2. **ppm** = parts per million
- 3. (%) = percent relative humidity
- 4. ${}^{\circ}\mathbf{F} = \text{degrees Fahrenheit}$

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 were above the recommended guideline of 30 60 % in two sampled areas. Relative humidity should remain within the recommended guideline of 30% to 60% in all occupied areas.
- 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 1,058 ppm (700 ppm + 358 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 damage was observed on the ceiling in the kitchen. In administrative areas, ceiling tiles were missing where water damage had occurred. Sources should be identified and corrected to ensure no further damage occurs.
 - 2. It was reported that the roof leaks in several places. Sources should be identified and corrected to ensure no further damage occurs.

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.

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	39018	3/2013	NA
Cal Light 400 Light Meter	98011EL	11/2012	NA
SKC Air Sampling Pump	647631	10/02/13	2.74 LPM
SKC Air Sampling Pump	647610	10/02/13	2.71 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



LAB #100470

Client:

National Guard Bureau

Job Name:

ARNG 4a MD

Chain Of Custody:

516884

Address:

301-IH Old Bay Lane, Attn: ARNG-CJG-P,

Job Location:

Queen Anne

Date Submitted:

10/7/2013

State Military Reservation

Job Number:

Not Provided

Person Submitting:

Havre de Grace, Maryland 21078

P.O. Number:

W912K6-09-A-0003

Date Analyzed:

10/25/2013

Report Date:

10/28/2013

Attention:

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number				Total ug	Final Res	sulf	Comments			
14001627	I	Flame	Air	493	N/A	6.1	ug/m³	<3	<6.1	ug/m³	
14001628	2	Flame	Air	488	N/A	6.1	ug/m³	<3	<6.1	ug/m³	
14001629	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
14001630	4	Flame	Wipe Blank	***	N/A	12	ug		<12	ug	
14001631	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/fl²	
14001632	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001633	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001634	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001635	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001636	10	Flame	Wipe	****	0.108	110	ug/ft²	740	6900	ug/ft²	
14001637	11	Flame	Wipe	****	0.108	110	ug/ft²	51	470	ug/ft²	
14001638	12	Flame	Wipe	****	0.108	110	ug/ft²	32	290	ug/ft²	
14001639	13	Flame	Wipe	****	0.108	110	ug/fl²	24	230	ug/ft²	
14001640	14	Flame	Wipe	****	0.108	110	ug/ft²	27	250	ug/ft²	
14001641	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ſl²	
14001642	16	Flame	Paint Chip	***	N/A	0.0094	%Pb		< 0.0094	%Pb	

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. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AIHA, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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AMA Analytical Services, Inc.

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CERTIFICATE OF ANALYSIS



Client:

National Guard Bureau

Job Name:

ARNG 4a MD

Chain Of Custody:

516884

Address:

301-IH Old Bay Lane, Attn: ARNG-CJG-P.

Job Location:

Queen Anne

Date Submitted:

10/7/2013

State Military Reservation

Job Number:

Not Provided

Person Submitting:

Havre de Grace, Maryland 21078

P.O. Number:

W912K6-09-A-0003

Date Analyzed:

10/25/2013

Report Date:

10/28/2013

Attention:

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample

Client Sample

Analysis Type

Sample Type

Air Volume

Area Wiped

Reporting

Total ug

associated with these

samples.

Final Result

See QC Summary for analytical results of quality control samples

Number

Number

(L)

(ft2)

Limit

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.

Posted to NGB FOIA Reading Room

Analyst:

Nida McGarvey

Technical Manager:

G Edward Carney

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. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AIHA, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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159202

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AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)

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4475 Forbes Blvd. • Lanham, MD 20706 (301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643 Mailing/Billing Information: Submittal Information: 4a MD ARNG 1. Client Name: National Guard Bureau 1. Job Name: 2. Address 1: 301-IH Old Bay Lane 2. Job Location: 3. Address 2: Attn: NGB-ARS-IHNE 3. Job #: W912K6-09-A-0003 4. Address 3: Havre de Grace, Maryland 21078 4. Contact Perso 5. Phone #: (410) 942-0273 Fax #: (410) 942-0254 5. Submitted by Reporting Information (Results will be provided as soon as technically reastore): NORMAL BUSINESS HOURS AFTER HOURS (must be pre-scheduled) REPORT TO: with Report a compliance place . com M Inclu ☐ Immediate O 3 Day ☐Immediate Date Due: Results Required By Noon X Emai ☐ Next Day D's Day + 24 Hours Time Due:_ (EveryAttempt Will Be O Fax: Date Due: 10 2 Day Made to Accomodate) Comments: @us.army.mil Q Verba Ashestos Analysis Metals Analysis TEM Bulk Pb Paint Chip. PCM Air - Please Indicate Filter Type: ☐ ELAP 198.4/Chatfield_ Pb Dust Wipe (wipe type 6thos T ☐ NIOSH 7400_ ☐ NY State PLM/TEM_ (QTY) ☐ Fiberglass _ Residual Ash_ TEM Air - Please Indicate Filter Type: Pb Soil/Solid -TEM Dust AHERA_ O Pb TCLP_ (QTY) Oual. (pres/abs) Vacuum/Dust___ ☐ NIOSH 7402 Drinking Water Pb (OTY) Q Cu (OTY) As (OTY) Quan. (s/area) Vacuum D5755-95 Other (specify_ (QTY) Waste Water D Pb. (OTY) Q Cu (OTY) Q As (OTY) Quan. (s/area)Dust D6480-99___ PLM Bulk Pb Furnace (Media (QTY) TEM Water ☐ EPA 600 - Visual Estimate (QTY) Fungal Analysis Qual. (pres/abs)_ ☐ EPA Point Count Collection Apparatus for Spore Traps/Air Samples:_ ☐ ELAP 198.2/EPA 100.2_ NY State Friable 198.1. Collection Media ☐ EPA 100.1____ Grav. Reduction ELAP 198.6. Surface Vacuum Dust Spore-Trap_ _(QTY) Other (specify_ All samples received in good condition unless otherwise noted. Surface Swab_ MISC (TEM Water samples _____°C) ☐ Surface Tape_ (QTY) Culturable ID Species (Media ☐ Vermiculite Other (Specify_ Asbestos Soil PLM_(Qual) PLM_(Quan) PLM/TEM_(Qual) PLM/TEM_(Quan) SAMPLE INFORMATION CLIENT CONTACT VOLUME WIPE CLIENT ID SAMPLE LOCATION/ NUMBER IDENTIFICATION DATE (LITERS) (LABORATORY STAFF ONLY) 493 Date/Time: Contact: By: 488 Assembly BLANK FLOOR CTR 20cm2 assembly HAIL Date/Time: Contact: By: TOP ABINET TOP RLOCKER ROOM Locker TOP FLR OUTSIDE FR DOOR Date/Time: Contact: By: FLOOR BULLET TYAD END LIGHT FLYWE TOP CABINET TOP By (Print): _ 1. Date/Time RCVD: LABORATORY 2. Date/Time Analyzed: STAFF ONLY: 3. Results Reported To: BEST AVAILABLE COPY Date: Initials: Posted 6 NGB POIA Reading Rooments: 14(1)

May, 2018

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Page 4556 of 5269

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Released by National Guard Bureau

Page 4557 of 5269

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Posted(toUsGBIFO)IA Reading Room
May, 2018

A. Comments:

May, 2018

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Appendix B. Photographs



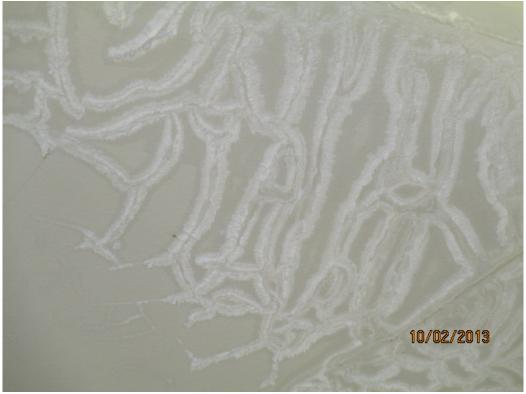
Queen Anne RC



Converted Firing Range



Boiler Room



Kitchen Water Damaged Ceiling



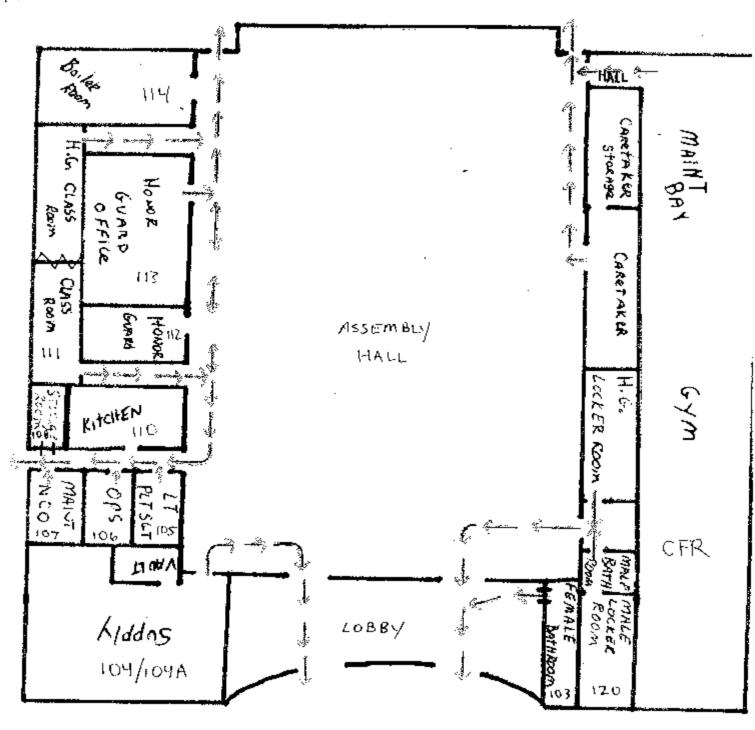
Missing Ceiling Tile Reported Water Damage



CFR Hallway Peeling Paint

Appendix C. Floor Plan

10/2/13



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

.....

MCHB-TS-OFS

May 2004

MEMORANDUM FOR Army National Guard Bureau (NGB) Region North Industrial Hygiene NGB-AVS-SI-IH Non-Responsive, 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 CSM Blair Lee Crockett Armory, Salisbury, MD

- 1. Enclosed is a copy of subject report and one CD-ROM.
- 2. Please direct any additional comments or concerns to Ms. Non-Responsive at DSN 584-5475/3118, commercial (410) 436-5475/3118 or e-mail address at Non-Responsive pagg.amedd.army.mil.

ENCL



Industrial Hygienist
Industrial Hygiene Field Services Program

Readiness thru Health
Printed on Recycled Paper

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







MDARNG FACILITIES IH BASELINE SURVEY CSM BLAIR LEE CROCKETT ARMORY SALISBURY, MD 55-ML-01ED-03











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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.

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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, CSM BLAIR LEE CROCKETT ARMORY SALISBURY, 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 armory relative humidity of 68.9 % exceeded the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) recommended guidelines for air quality of 30 % to 60 % relative humidity. The indoor temperature of 81.1 degrees Fahrenheit exceeded the ASHRAE recommended guidelines for an acceptable thermal environment of 73 to 79 degrees Fahrenheit in the summer and 68 to 74.5 degrees Fahrenheit in the winter at 50 % relative humidity. Carbon dioxide levels in all rooms with the exception of the locker room (former IFR) met the ASHRAE recommended guidelines. To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room not exceed 700 parts per million (ppm) more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. Therefore the total carbon dioxide level should not exceed approximately 1050 ppm in this armory.
- b. Lead. All air samples are below the laboratory analytical detection limit for lead in air of 3.0 to $15.0\mu g/m^3$, and are below the Occupational Health and Safety Administration (OSHA) standard of $50\mu g/m^3$ for lead in air. Four dust-lead wipe sample results, located in the locker room (BO5) floor near the back wall (trap area, shooting lane, and lobby area of former range), $(880\mu g/ft^2)$ ($370\mu g/ft^2$) ($490\mu g/ft^2$), and ($320\mu g/ft^2$) exceeded the USACHPPM recommended decontamination level of $200\mu g/ft^2$ for dust-lead on frequently contacted surfaces. Samples collected from the utility room on the floor by the door to the outside ($320\mu g/ft^2$), and from the vehicle maintenance room floor bay 1 ($250\mu g/ft^2$) exceeded the USACHPPM recommended decontamination level of $200\mu g/ft^2$ for dust-lead on frequently contacted surfaces.
- c. Industrial Hygiene and Safety Programs. There is no Hazard Communication Program (HAZCOM) available for full time state workers who have oversight of the armory. They do have personal protective equipment (PPE) but no PPE program. They have material safety data sheets (MSDS) for the vehicle maintenance area of the facility.

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3. RECOMMENDATIONS.

- a. Indoor Air Quality. 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. The RAC for this armory for Indoor Air Quality is classified as 5. To improve thermal comfort, install more air conditioning units or fans to cool the armory to between 73 and 79 degrees Fahrenheit in the summer. The temperature in the winter should be between 68 and 74.5 degrees Fahrenheit. The indoor temperature of 81.1 degrees Fahrenheit exceeded the ASHRAE recommended guidelines for an acceptable thermal environment. The armory relative humidity of 68.9 % exceeded the recommended ASHRAE guidelines for air quality. USACHPPM recommends either closing the windows and turning on the window air conditioning units or using a portable dehumidifier in the summer months. Carbon dioxide levels in all rooms with the exception of the locker room (former IFR) met the ASHRAE recommended guidelines. 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. Check the ventilation system and ensure that the proper level of outdoor air is supplied.
- b. Lead. The RAC for Lead Exposure is classified as 5. Many dust-lead sample results exceeded the USACHPPM recommended decontamination level of 200µg/ft² for dust-lead on frequently contacted surfaces, as well as the EPA lead exposure levels of $40\mu g/ft^2$ 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. Recleaning and sealing the former firing range area may further prevent exposures for children under six and for the general workforce. Clean all areas in and adjacent to the locker room (BO5) floor (former IFR), the utility room floor, and the vehicle maintenance room floor, bay 1 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. These actions should be accomplished before allowing children into 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. 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. Test drinking water from water fountains and faucets for 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 $250\mu g/ft^2$ for dust-lead on window sills.

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EXSUM, MDARNG Facilities IH Baseline Surveys, CSM Blair Lee Crockett Armory, Salisbury, MD Project No. 55-ML-01ED-03

c. Industrial Hygiene and Safety Programs. Provide a HAZCOM and Respiratory Protection Program for the full time state workers who oversee the armory. Conduct a complete health hazard assessment inventory of the vehicle maintenance shop.

TABLE OF CONTENTS

Pai	ragraph	Page
 2. 3. 4. 6. 7. 8. 	AUTHORITY PURPOSE OF EVALUATION BACKGROUND INFORMATION SUMMARY OF ACTIONS ASSESSMENT CRITERIA OF LEAD SAMPLING RESULTS DISCUSSION AND CONCLUSIONS RECOMMENDATIONS	1 1 3 3 6
	ADDITIONAL ASSISTANCE	7
Lili	Closure	
2.	Lead Exposure	9
Ap	ppendices	
B. C. D. E.	- ASSESSMENT CRITERIA FOR LEAD	B-1 C-1 D-1 E-1
	- MOLD GUIDANCE	



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 SEE DISTRIBUTION

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

LOCATION: CSM Blair Lee Crockett Armory, Salisbury, MD

- 1. AUTHORITY. E-Mail dated 28 February 2003 from Ms Non-Responsive, 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 17th Military Police Battalion.
- b. Date of Construction. 1958.
- c. POC. Non-Responsive (410) 974-7400 Cell (443) 277-4923.
- d. Survey. Date: 04 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 relative humidity measurements were collected to determine indoor air quality. Lighting conditions were measured. Sample locations are in Appendix D.
 - b. Physical Condition of Facilities.

- (1) Paint. The paint condition is intact. Sergeant Non-Responsive, Environmental Compliance Assessment Coordinator for the MD NGB, stated that there are no records of lead-based paint abatement.
- (2) Asbestos. Staff Sergeant 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. None.
- d. Safety and Industrial Hygiene Programs. There are no written program records at the armory. There is no Hazard Communication Program (HAZCOM) available for full time state workers who have oversight of the armory. They do have personal protective equipment (PPE) but no PPE program. They have material safety data sheets (MSDS) for the vehicle maintenance area of the facility.
- e. Heating, Ventilation, and Air-conditioning System. There is no central ventilation and HVAC system. Ventilation and air are 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 eight locations. Some measurements were taken with the lights off, because the rooms are normally used with the lights off. The list of locations measured and results are provided in Table 2, Appendix D.
- h. Converted indoor firing range (IFR). Staff Sergeant Ruth McCuen, Environmental Compliance Assessment Coordinator for the MD NGB, stated that there are no records of a lead abatement for the indoor firing range during its conversion. The IFR has been converted into a locker room and gym.
 - i. Photographs (Appendix C).
 - j. Site Maps (Appendix B).
- k. Facility use by children. The POC stated that the armory is used extensively by the community and has wide-ranging use by children.

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

6. SAMPLING RESULTS.

a. The armory relative humidity of 68.9 % exceeded the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) recommended guidelines for air quality which are between 30% and 60%. The indoor temperature of 81.1 degrees Fahrenheit exceeded the ASHRAE recommended guidelines for an acceptable thermal environment which are between 73 and 79 degrees Fahrenheit in the summer and between 68-74.5 degrees Fahrenheit in the winter at 50 % relative humidity.

All indoor carbon dioxide levels met the ASHRAE recommended guidelines with the exception of the locker room (former IFR), which had a carbon dioxide level of 1445 parts per million (ppm). The indoor carbon dioxide levels ranged from 356-1445 ppm (See Table 1). To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. Therefore the total carbon dioxide level should not exceed approximately 1050 ppm in this armory.

Table 1: Q-Trak Measurements for Indoor Air Quality

Location	Floor	Indoor CO2 Measurement	Outdoor CO2
Operations (BO1)	Basement	395 parts per million (ppm) CO ₂	350 ppm CO ₂
Locker Room (BO5) (former	Basement	1445 ppm	350 ppm CO ₂
Range)			
Utility Room	Basement	444 ppm	350 ppm CO ₂
HHC Orderly Room	First	503 ppm	350 ppm CO ₂
Vehicle Maintenance Room	First	359 ppm (outside bay	350 ppm CO ₂
(2 bays)		doors open)	
Break room (small kitchen)	First	405 ppm	350 ppm CO ₂
Drill Room	First	360 ppm	350 ppm CO ₂
Recruiters Office	First	441 ppm	350 ppm CO ₂
Main Kitchen	First	364 ppm	350 ppm CO ₂
Supply Room (117)	First	500 ppm	350 ppm CO ₂
Office HQ 115 th MP BN	Second	370 ppm	350 ppm CO ₂
Lounge & Training Room	Second	463 ppm	350 ppm CO ₂
Office 115 th MP BN S2/3	Second	356 ppm	350 ppm CO ₂

b. Illumination. All areas of the armory appeared to be adequately lit and occupants reported no areas of deficient lighting. The lighting met the Illumination Engineering Society of North America Guidelines. (See Table 2).

Table 2: Lighting Measurements

Location	Floor	Measurement	Guidelines
Locker Room (former bullet	Basement	1.2 Foot Candles (FC)	10 FC
trap area)			
Locker Room (middle of	Basement	19.6 FC	10 FC
room)			
Locker Room (Gym Area)	Basement	7.3 FC	10 FC
Utility Room	Basement	5.2 FC	5 FC
Ops Room (BO1)	Basement	50.1 FC	50-100 FC
Orderly Room HQ 117 th MP	Second	34.0 FC	20-50 FC
BN			
S2/3 Office HQ 117 th MP BN	Second	90.2 FC	20-50 FC
Lounge & Training Room	Second	64.7 FC	10-20 FC
Vehicle Maintenance Room	First	77.0 FC	20-50 FC
(2 bays)			
Drill Room (no lights on)	First	40.9 FC	10 FC
	First	19.7 FC	20 FC
Break Room (small kitchen)	_		
Recruiters Office	First	36.0 FC	20-50 FC
MP Military Personnel Office	First	29.5 FC	20-50 FC

c. Lead. All air samples are below the laboratory analytical detection limit for lead in air of 3.0 to $15.0\mu g/m^3$ as well as the Occupational Health and Safety Administration (OSHA) standard of $50\mu g/m^3$ for lead in air. Four dust-lead wipe sample results, located in the locker room (BO5) floor near the back wall (trap area of former range), exceeded the USACHPPM recommended decontamination level of $200\mu g/ft^2$ for dust-lead on frequently contacted surfaces (photo #s 0974-0977). Samples collected from the utility room, the floor by the door to the outside (0978) and the vehicle maintenance room floor (0985), bay 1, exceeded the USACHPPM recommended decontamination level of $200\mu g/ft^2$ for dust-lead on frequently contacted surfaces. (See Table 2).

Table 3 Lead Air and Dust Wipe Samples

		Just Wipe Samples	I	Dhata	1
Sample Numbers	Type of Sample	Location	Floor	Photo #	Result
SA W01	Wipe	Locker Room (BO5), floor, near back wall (trap area of former range)	Basement	0974	880 μg/ft²
SA W02	Wipe	Locker Room (BO5), floor, 15ft from back wall (shooting lane of former range)	Basement	0975	370 µg/ft²
SA W03	Wipe	Locker Room (BO5), floor, 30ft from back wall (shooting lane of former range)	Basement	0976	490 μg/ft²
SA W04	Wipe	Locker Room (BO5) (Gym area), floor, 15ft from entrance door (lobby area of former range)	Basement	0977	180 μg/ft²
SA W05	Wipe	Utility Room, floor by door to outside	Basement	0978	320 μg/ft²
SA W06	Wipe	OPS Room (BO1), floor, far wall under typewriter position	Basement	0979	13 μg/ft²
SA W07	Wipe	Office HQ 117 th MP BN, desk top, far corner by supply closet	Second	0981	1.9 µg/ft²
SA W08	Wipe	Office S2/3 window sill	Second	0982	14 μg/ft ²
SA W09	Wipe	Lounge & Training Room top of bar	Second	0983	1.6 µg/ft ²
SA W10	Wipe	Lounge & Training Room top of table back of room	Second	0984	4.4 μg/ft ²
SA W11	Wipe	Vehicle Maintenance Room, floor, bay1	First	0985	250 μg/ft²
SA W12	Wipe	Drill Room, floor, next to back wall	First	0986	12 μg/ft ²
SA W13	Wipe	Drill Room, floor, center court	First	0987	11 μg/ft²
SA W14	Wipe	Drill Room, floor, near orderly room	First	0988	3.1 µg/ft ²
SA W15	Wipe	Break room (small kitchen), counter top near window	First	0990	$< 2.8 \mu g/ft^2$
40903RR07	Air	Supply Office (117)	First	0980	<12 mg/m ³
40903RR08	Air	Operation Office (BO1)	Basement	0989	<12 mg/m ³

7. DISCUSSION AND CONCLUSIONS.

- a. The armory relative humidity of 68.9 % exceeded the ASHRAE recommended guidelines for air quality of 30 to 60 % relative humidity. The indoor temperature of 81.1 degrees Fahrenheit exceeds the ASHRAE recommended guidelines for an acceptable thermal environment which are between 73 to 79 degrees Fahrenheit in the summer and between 68 and 74.5 degrees Fahrenheit in the winter at 50 % relative humidity. Carbon dioxide levels in all rooms with the exception of the locker room (former IFR) met the ASHRAE recommended guidelines. The indoor carbon dioxide levels ranged from 356-1445 ppm. To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. Therefore the total carbon dioxide level should not exceed approximately 1050 ppm in this armory.
- b. All air samples are below the laboratory analytical detection limit for lead in air of 3.0 to $15.0\mu g/m^3$. They are also below the Occupational Health and Safety Administration (OSHA) standard of $50\mu g/m^3$ for lead in air. Four dust-lead wipe sample results, located in the locker room (BO5) floor near the back wall (trap area, shooting lane, and lobby area of former range), $(880\mu g/ft^2)$ ($370\mu g/ft^2$) ($490\mu g/ft^2$), and ($320\mu g/ft^2$) exceeded the USACHPPM recommended decontamination level of $200\mu g/ft^2$ for dust-lead on frequently contacted surfaces (photo #s 0974-0977). Samples collected from the utility room on the floor by the door to the outside (0978) ($320\mu g/ft^2$), and from the vehicle maintenance room floor bay 1 (0985) ($250\mu g/ft^2$) exceeded the USACHPPM recommended decontamination level of $200\mu g/ft^2$ for dust-lead on frequently contacted surfaces. All these sample results exceeded the EPA lead exposure levels of $40\mu g/ft^2$ 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.
- c. There is no Hazard Communication Program (HAZCOM) available for full time state workers who have oversight of the armory. They do have personal protective equipment (PPE) but no PPE program. They have material safety data sheets (MSDS) for the vehicle maintenance area of the facility.

- 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 Non-Responsive @apg.amedd.army.mil.

Non-Responsive

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, CSM Blair Lee Crockett Armory, Salisbury, MD Project No. 55-ML-01ED-03

ENCLOSURE

SALISBURY 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 classified as 5.

1. Lead Exposure. RAC 5.

- a. Clean all areas in and adjacent to the locker room (BO5) floor (former IFR), the utility room floor, and the vehicle maintenance room floor, bay 1 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. Apply a sealant to the area. These actions should be accomplished before allowing children into 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.
- 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 $250\mu g/ft^2$ for dust-lead on window sills.

MDARNG Facilities IH Baseline Surveys, CSM Blair Lee Crockett Armory, Salisbury, MD Project No. 55-ML-01ED-03

2. Indoor Air Quality. RAC 5.

- 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 81.1 degrees Fahrenheit exceeds the ASHRAE recommended guidelines for an acceptable thermal environment.
- b. The armory relative humidity of 68.9 % exceeds the ASHRAE recommended guidelines for air quality which are between 30%- 60 %. USACHPPM recommends either closing the windows and turning on the window air conditioning units or using a portable dehumidifier in the summer months.
- c. Check the ventilation system and ensure that the proper level of outdoor air is supplied. Carbon dioxide levels in all rooms with the exception of the locker room (former IFR) met the ASHRAE recommended guidelines. 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.

3. Additional Recommendations.

- a. Provide a HAZCOM and Respiratory Protection Program for the full time state workers who oversee the armory.
 - b. Conduct a complete health hazard assessment inventory of the vehicle maintenance shop.

MDARNG Facilities IH Baseline Surveys CSM Blair Lee Crockett Armory, Salisbury, 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 $200 \,\mu\text{g/ft}^2$. 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 μ g/ft²), windowsills (250 μ g/ft²) and window troughs (400 μ g/ft²) 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 μ g/ft² 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/m³ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

MDARNG Facilities IH Baseline Surveys CSM Blair Lee Crockett Armory, Salisbury, MD Project No. 55-ML-01ED-03

APPENDIX B

SITE MAPS

MDARNG Facilities IH Baseline Surveys CSM Blair Lee Crockett Armory, Salisbury, MD Project No. 55-ML-01ED-03

APPENDIX C

PHOTOGRAPHS

Photo #	Location	Floor
0974	Locker Room (BO5), floor, near back	Basement
	wall (trap area of former range)	
0975	Locker Room (BO5), floor, 15ft from	Basement
	back wall (shooting lane of former	
	range)	
0976	Locker Room (BO5), floor, 30ft from	Basement
	back wall (shooting lane of former	
	range)	
0977	Locker Room (BO5) (Gym area), floor,	Basement
	15ft from entrance door (lobby area of	
	former range)	
0978	Utility Room, floor by door to outside	Basement
0979	OPS Room (BO1), floor, far wall under	Basement
	typewriter position	
0981	Office HQ 117 th MP BN, desk top, far	Second
	corner by supply closet	
0982	Office S2/3 window sill	Second
0983	Lounge & Training Room top of bar	Second
0984	Lounge & Training Room top of table	Second
	back of room	
0985	Vehicle Maintenance Room, floor, bay1	First
0986	Drill Room, floor, next to back wall	First
0987	Drill Room, floor, center court	First
0988	Drill Room, floor, near orderly room	First
0990	Break room (small kitchen), counter top	First
	near window	
0980	Supply Office (117)	First
0989	Operation Office (BO1)	Basement

MARYLAND NATIONAL GUARD SALISBURY ARMORY 1958

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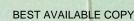
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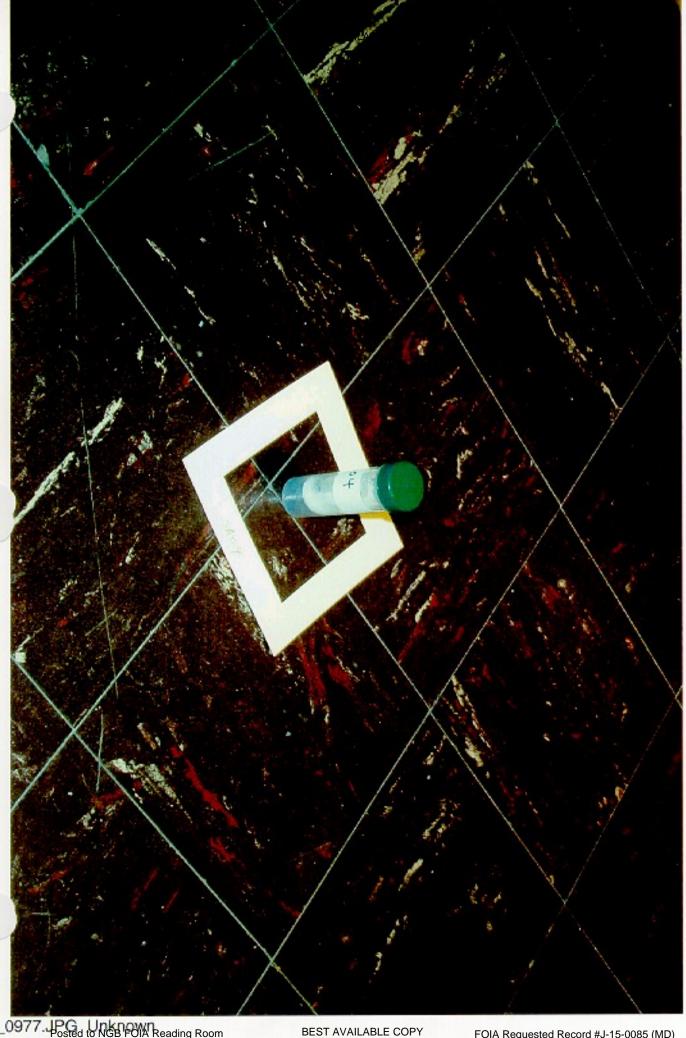
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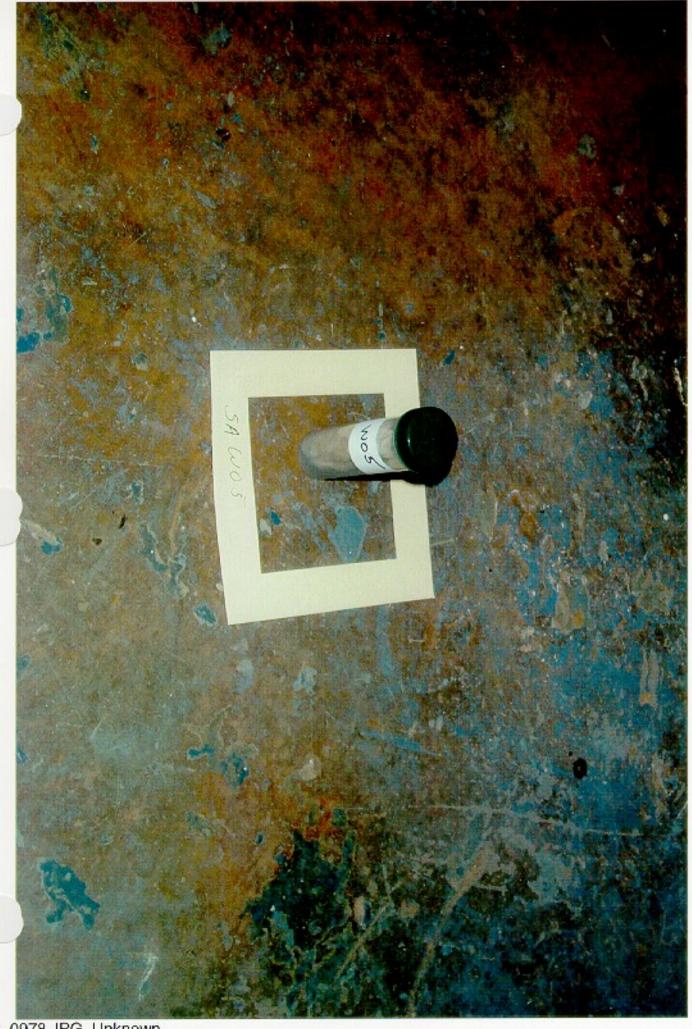
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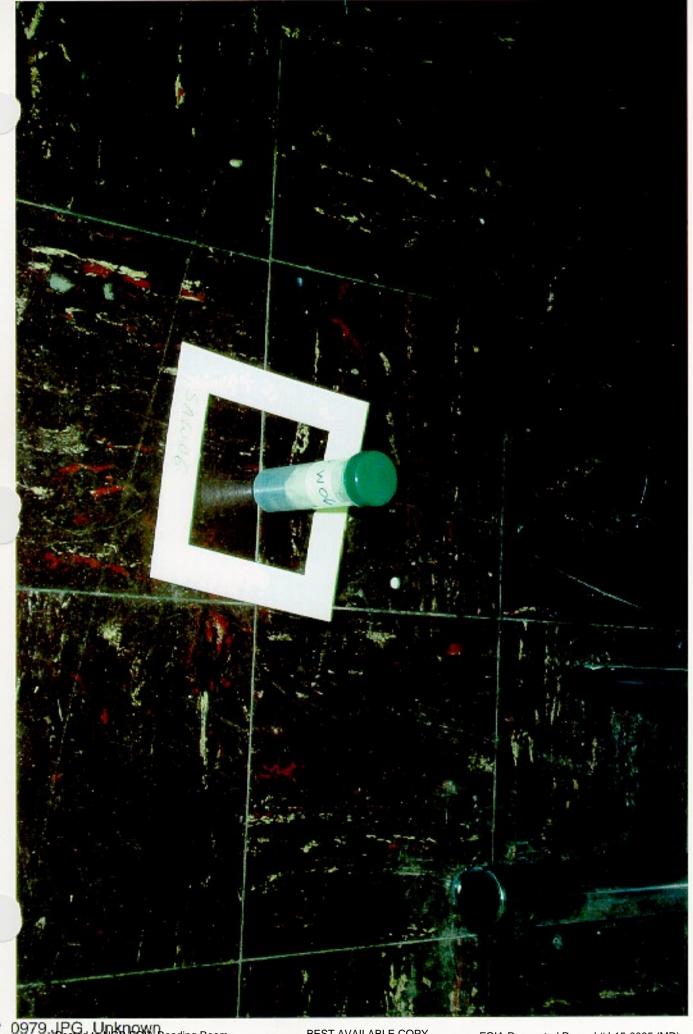
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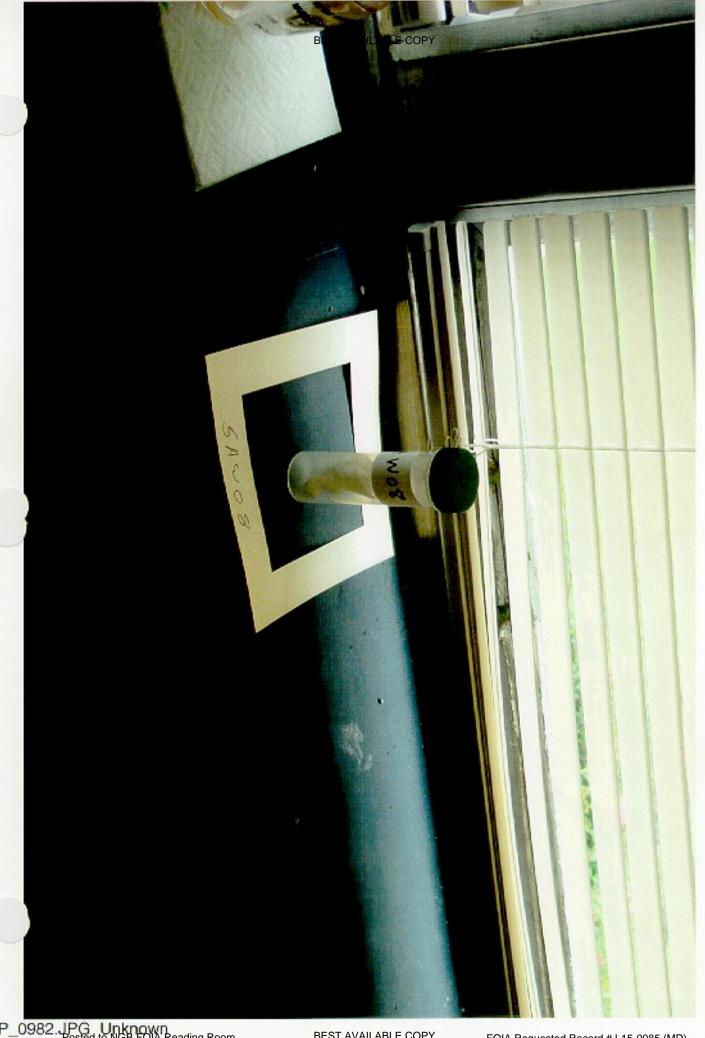
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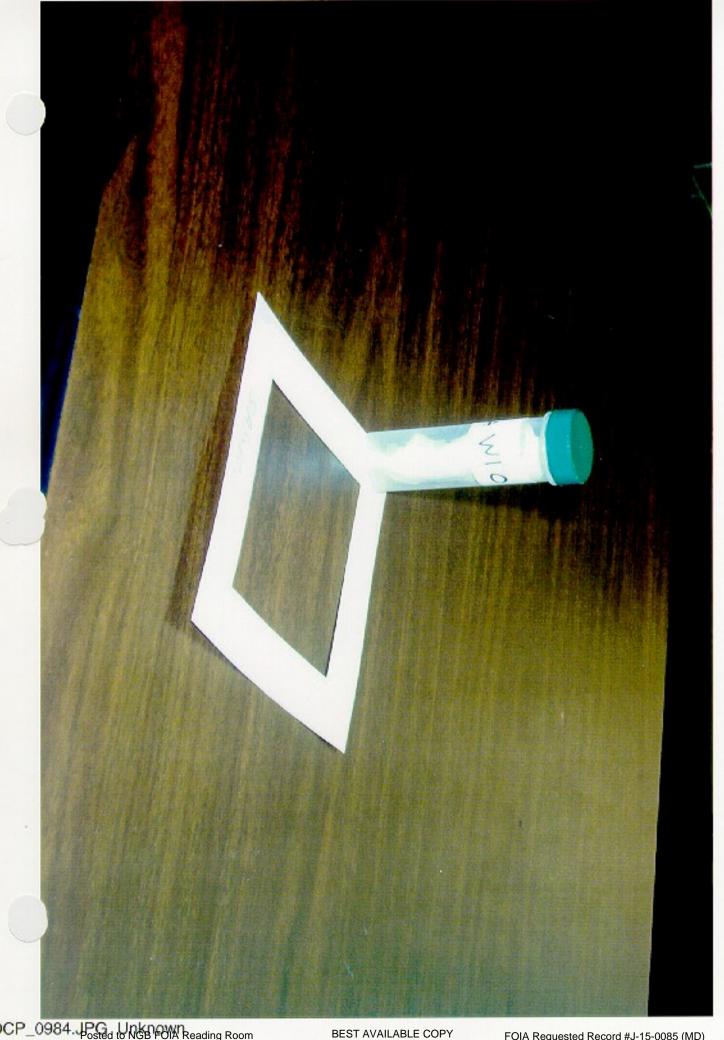
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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 4597 of 5269



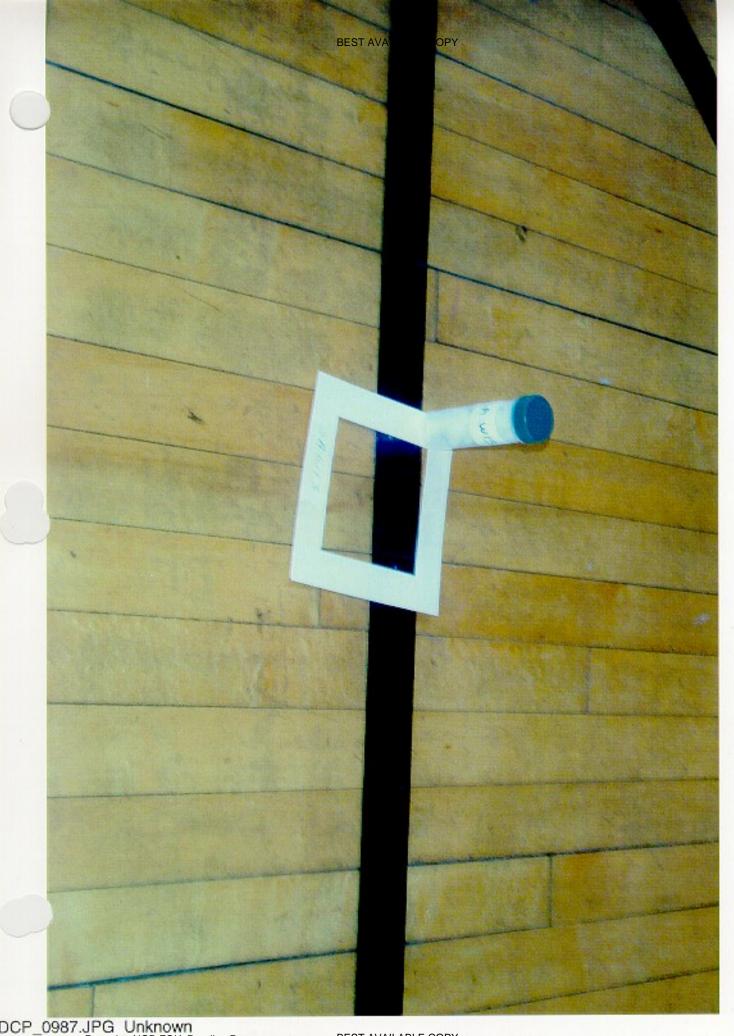
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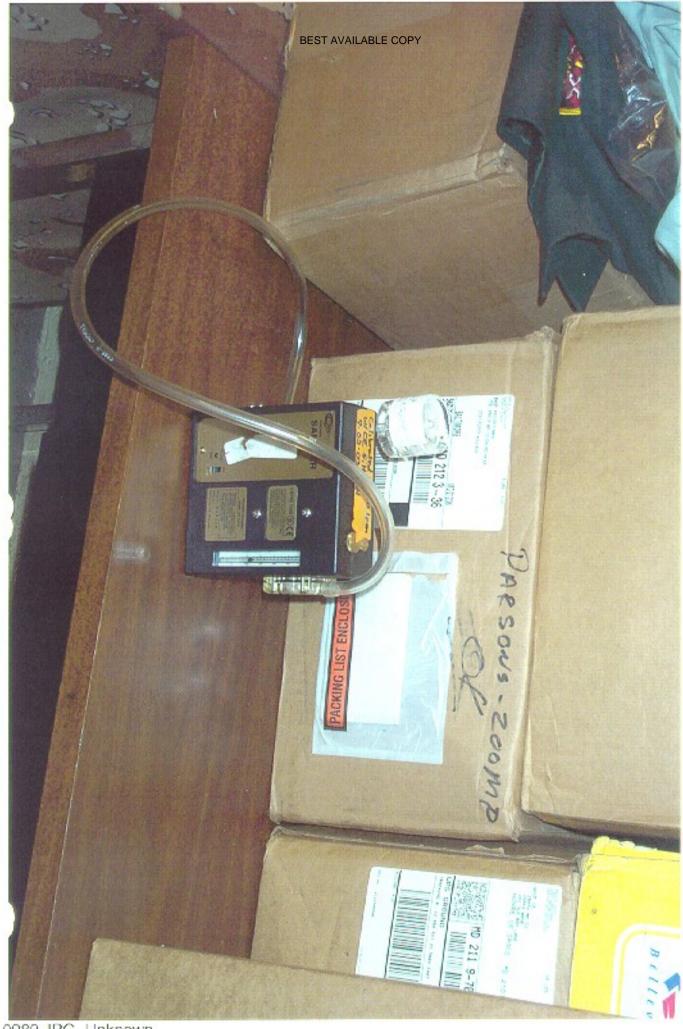
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MDARNG Facilities IH Baseline Surveys CSM Blair Lee Crockett Armory, Salisbury, MD Project No. 55-ML-01ED-03

APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES



				Indoor Ra	inge k	nfo	1			
Wipe Sample #	Armory City		Active Inactive N/A Cleaned?			Cleaned?	Location of Samples	Floor	Conc. (pg/ft²)	
				Yes		Yes				
SA W01	Salisbury	Salisbury					Locker Room (BO5), floor, near back wall (trap area of former range)	Basement	880	
SA W02						:	Locker Room (BO5), floor, 15ft from back wall (shooting lane of former range)	Basement	370	
	Salisbury	Salisbury							<u> </u>	
SA W03	Catiahua	Callabura					Locker Room (BO5), floor, 30ft from back wall (shooting land of former range)	Basement	490	
SA W04	Salisbury	Salisbury					Locker Room (BO5) (Gym area), floor, 15ft from entrance door (lobby area of former range)	Basement	180	
\$A W05	Salisbury	Salisbury					Utility Room, floor by door to outside	Basement	320	
SA W06	Salisbury	Salisbury					OPS Room (BOT), floor, far wall under typewriter position	Basement	13	
SA W07	Salisbury	Salisbury					Office HQ 117 th MP BN, desk top, far corner by supply closet	Second	1.9	
SA W08	Salisbury	Salisbury					Office S2/3 window sill	Second	14	
SA W09	Salisbury	Satisbury					Lounge & Training Room top of bar	Second	1.6	
SA W10	Salisbury	Salisbury					Lounge & Training Room top of table back of room	Second	4,4	
SA WH	Salisbury	Salisbury	1				Vehicle Maintenance Room, floor, bay1	First	250	
SA W12	Salisbury	Salisbury	1				Drill Room, floor, next to back wall	First	12	
SA W13	Şalisbury	Salisbury					Drill Room, floor, center court	First	11	
SA W14	Salisbury	Salisbury					Drill Room, floor, near orderly room	First	3.1	
SA W15	Salisbury	Salisbury					Break room (small kitchen), counter top near window	First	<2.8	







Page 1 of 2

Client:

US Army - CHPPM

Job Name:

MD ARNG Salisbury

Chain Of Custody:

117741

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:

Non-Responsiv

.1010-5405

P.O. Number:

Not Provided

Report Date:

17-Sep-03

Attention:



Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number SA Blank 1	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		F	inal Res	ult	Comments	
		Furnace	Wipe Blank	***	N/A	0.15	ug	<	0.15	ug		
0368025	SA W01	Furnace	Wipe	****	0.108	139.41	ug/ft²		880	ug/ft²		
0368026	SA W02	Furnace	Wipe	****	0.108	69.70	ug/ft²		370	ug/ft²		
0368027	SA W03	Furnace	Wipe	****	0.108	278.81	ug/ft²		490	ug/ft²		
0368028	SA W04	Furnace	Wipe	****	0.108	69.70	ug/ft²		180	ug/ft²		
0368029	SA W05	Furnace	Wipe	****	0.108	69.70	ug/ft²		320	ug/ft²		
0368030	SA Blank 2	Furnace	Wipe Blank	****	N/A	0.15	ug	<	0.15	ug		
0368031	SA W06	Furnace	Wipe	****	0.108	2.79	ug/ft²		13	ug/ft²		
0368032	SA W07	Furnace	Wipe	****	0.108	1.39	ug/ft²		1.9	ug/ft²		
0368033	SA W08	Furnace	Wipe	****	0.108	2.79	ug/ft²		14	ug/ft²		
0368034	SA W09	Furnace	Wipe	****	0.108	1.39	ug/ft²		1.6	ug/ft²		
0368035	SA W10	Furnace	Wipe	***	0.108	1.39	ug/ft²		4.4	ug/ft²		
0368036	SA Blank 3	Furnace	Wipe Blank	****	N/A	0.15	ug	<	0.15	ug		
0368037	SA W11	Furnace	Wipe	****	0.108	69.70	ug/ft²		250	ug/ft²		
0368038	SA W12	Furnace	Wipe	****	0.108	2.79	ug/ft²		12	ug/ft²		
0368039	SA W13	Furnace	Wipe	****	0.108	2.79	ug/ft²		11	ug/ft²		
0368040	SA W14	Furnace	Wipe	****	0.108	2.79	ug/ft²		3.1	ug/ft²		
0368041	SA W15	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/ft²		
0368042	SA Blank 4	Furnace	Wipe Blank	****	N/A	0.15	ug	. <	0.15	ug		

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Client:

US Army - CHPPM

Job Name:

MD ARNG Salisbury

Chain Of Custody:

117741

Address:

Attn: MCHB-TS-OFS, 5158 Blackhawk Road

Job Location: Not Provided Date Analyzed:

09/17/2003

Aberdeen Proving Grounds, Maryland

Job Number:

Not Provided

Person Submitting:

21010-5403

P.O. Number:

Not Provided

Report Date:

17-Sep-03

Attention:

Page 2 of 2

Summary of Atomic Absorption Analysis for Lead

Final Result Comments Area Wiped Analysis Type Sample Type Air Volume Reporting AMA Sample Client Sample Limit Number (L) (ft²) Number

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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Job Name:

MD ARNG Salisbury

Chain Of Custody:

117741

Address:

Attn: MCHB-TS-OFS, 5158 Blackhawk Road

Job Location: Not Provided

Date Analyzed:

09/17/2003

Aberdeen Proving Grounds, Maryland

Job Number:

Not Provided

Person Submitting:

Non-Responsiv

21010-5403

P.O. Number:

Not Provided

Report Date:

17-Sep-03

Attention:

Non-Responsive

Page 1 of 2

Summary of Atomic Absorption Analysis for Lead

Number Nu	Clicat Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ſt²)	Rep L	orting imit	F	inal Res		Comments	
	SA Blank 1	Furnace	Wipe Blank	***	N/A	0.15	ug	<	0.15	ug		
0368025	SA W01	Furnace	Wipe	****	0.108	139.41	ug/ft²		880	ug/ft²		
0368026	SA W02	Furnace	Wipe	****	0.108	69.70	ug/ft²		370	ug/ft²		
0368027	SA W03	Furnace	Wipe	****	0.108	278.81	ug/ft²		490	ug/ft²		
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0368032	SA W07	Furnace	Wipe	****	0.108	1.39	ug/fl²		1.9	ug/ft²		
0368033	SA W08	Furnace	Wipc	****	0.108	2.79	ug/ft²		14	ug/ft²		
0368034	SA W09	Furnace	Wipe	****	0.108	1.39	ug/ft²		1.6	ug/ft²		
0368035	SA W10	Furnace	Wipe	****	0.108	1.39	ug/ft²		4.4	ug/fl²		
0368036	SA Blank 3	Furnace	Wipe Blank	****	N/A	0.15	ug	<	0.15	ug		
0368037	SA WII	Furnace	Wipe	****	0.108	69.70	ug/ft²		250	ug/ft²		
0368038	SA W12	Furnace	Wipc	***	0.108	2.79	ug/ft²		12	ug/ft²		
0368039	SA W13	Furnace	Wipe	****	0.108	2.79	ug/ft²		11	ug/ft²		
0368040	SA W14	Furnace	Wipe	****	0.108	2.79	ug/ft²		3.1	ug/ft²		
0368041	SA W15	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/ft²		
0368042	SA Blank 4	Furnace	Wipe Blank	****	N/A	0.15	ug	. <	0.15	ug		

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CERTIFICATE OF ANALYSIS



Client:

US Army - CHPPM

Job Name:

MD ARNG Salisbury

Chain Of Custody:

117741

Address:

Attn: MCHB-TS-OFS, 5158 Blackhawk Road

Job Location: Not Provided Date Analyzed:

09/17/2003

Aberdeen Proving Grounds, Maryland

Job Number:

Not Provided

Person Submitting:

21010-5403

P.O. Number:

Not Provided

Report Date:

17-Sep-03

Attention:



Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Client Sample Analysis Type Sample Type Area Wiped Air Volume Reporting Final Result Comments Number Number (ft¹) Limit

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) ua = 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.

%Pb = percent lead by weight

Technical Manager:

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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

Job Number:

Not Provided

Person Submitting:

21010-5403

P.O. Number:

Not Provided

Report Date:

17-Sep-03

Attention:

Page I of I

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Aîr Volume (L)	Area Wiped (ft²)	Rep	orting imit	F	inal Re		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 B1	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.

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APPENDIX E

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APPENDIX E

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APPENDIX F

LEAD CLEANING GUIDANCE





CHAPTER 14: CLEANING

Ste	p-b	by-Step Summary	14–3
I.	Int	troduction	14–5
	A.	Performance Standard	14–5
	B.	Small Dust Particles	14–5
	C.	Difficulties in Cleaning	14–5
		1. Low Clearance Standards	14–5
		2. Worker Inexperience	14–6
		3. High Dust-Producing Methods and/or Inadequate Containment	14–6
		4. Deadlines	14–6
П.	Со	ordination of Cleaning Activities	14–6
	A.	Checklist	14–6
	B.	Equipment Needed for Cleaning	14–6
	C.	Waste Disposal	14–7
III.	Cle	eaning Methods and Procedures	14–7
	A.	Containment	14–7
	B.	Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques	14–7
		1. HEPA Vacuuming	
		2. Wet-Detergent Wash	14–9
		3. The HEPA/Wet Wash/HEPA Cycle	. 14–11
		4. Sealing Floors	
IV.	Or	der of Cleaning Procedures During Lead Hazard Control	. 14–16
	A.	Precleaning Procedures	. 14–16
	B.	Ongoing Cleaning During the Job	. 14–18
	C.	Daily Cleaning Procedures	. 14–18
		1. Large Debris	. 14–18
		2. Small Debris	. 14–18
		3. Exterior Cleaning	. 14–18
		4. Worker Protection Measures	. 14–19
		5. Maintaining Containment	. 14–19





V.	Order of Final Cleaning Procedures After Lead Hazard Control			
	Lea	ad Hazard Control	14-19	
	A.	Final Cleaning	14–19	
		1. Decontamination of Workers, Supplies, and Equipment	14-19	
	B.	Preliminary Visual Examination	14-20	
	C.	Surface Painting or Sealing of Nonfloor Surfaces	14-20	
	D.	Final Inspection	14-20	
	E.	Recleaning After Clearance Failure	14-20	
VI.	Cle	eaning Cost Considerations	14–21	
	Α.	Initial Clearance Test Failure Rates	14-21	
	B.	Key Factors In Effective Cleaning	14-21	
	C.	Special Problems	14–21	
VII	. A	Iternative Methods	14-22	
	Α.	Vacuums	14-22	
	R	Trisadium Phosphata and Other Detergents	1/ 22	



Step-by-Step Summary



Cleaning: How To Do It

- 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.
- 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.
- For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
- 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.
- 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.



-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).





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.

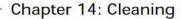
1. Low Clearance Standards

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 μg/ft² on floors.
- 500 µg/ft² on interior window sills (stools).
- 800 µg/ft² on window troughs (the area where the sash sits when closed).
- 800 μg/ft² 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.







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.

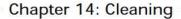
Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and triso-dium 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 finedust 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.

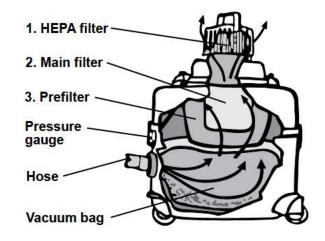
Emptying the HEPA Vacuum

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 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 highphosphate 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



Pressure gauge

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 wetwash 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. EMERGENCY EYE WASH STATION Latex Neoprene Nitrile

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:

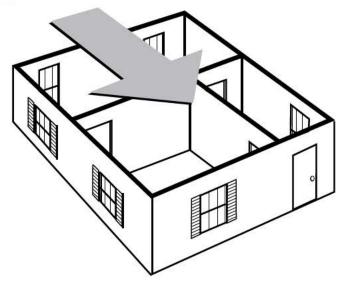
First, the area is HEPA vacuumed.



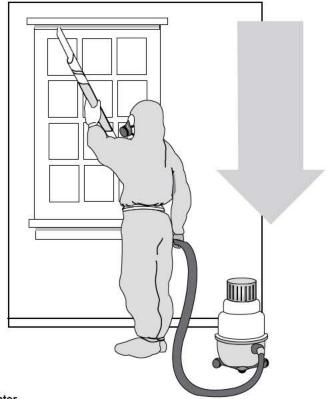


Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

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





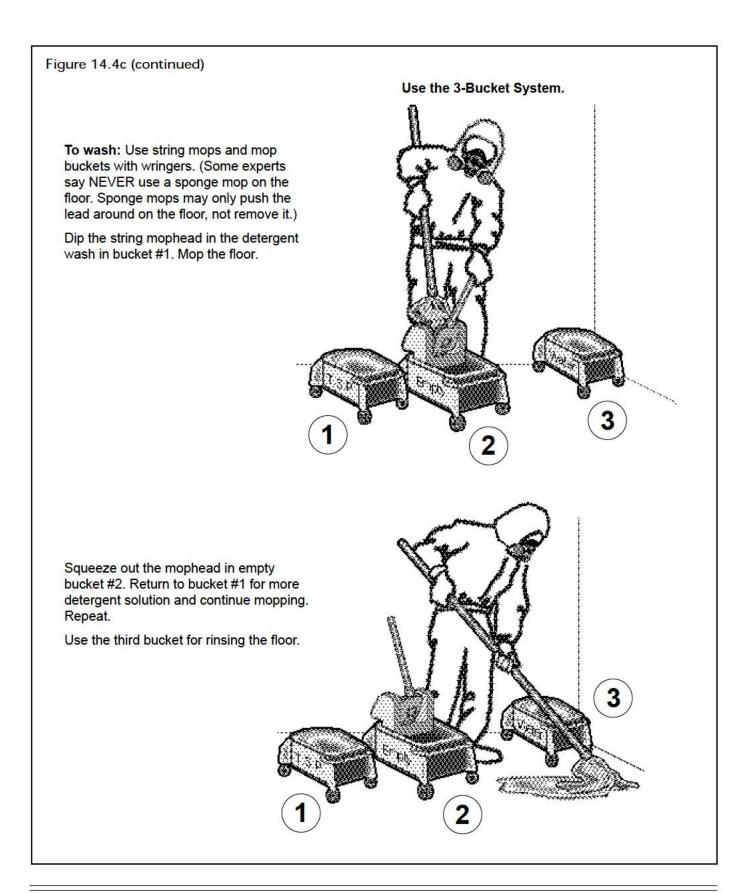


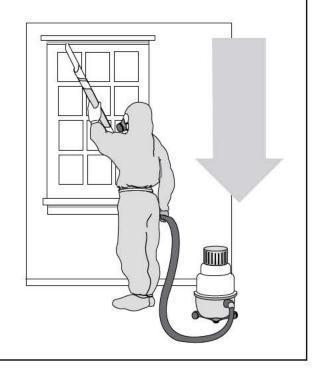




Figure 14.4d (continued)

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

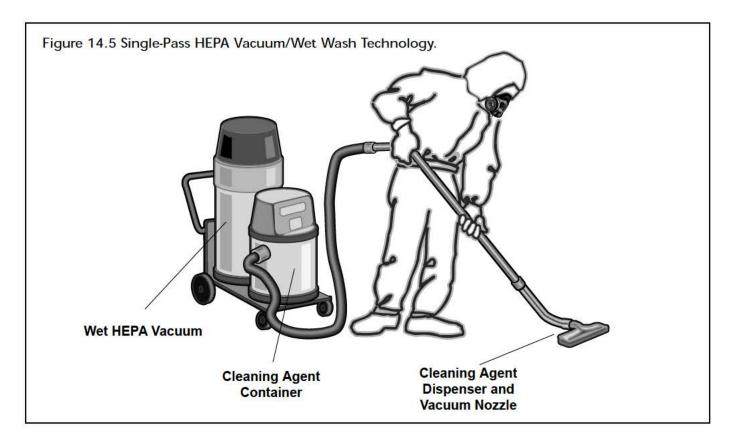
The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

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







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



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

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





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 dustretaining 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

	Mass Removal Efficiency Percentages						
Cycle Number	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 CSM Blair Lee Crockett Armory, Salisbury, MD Project No. 55-ML-01ED-03

APPENDIX G

MOLD GUIDANCE

Army Facilities Management Information Document on Mold Remediation Issues

TG 277 FEBRUARY 2002



ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

INTRODUCTION	2
MOLD PREVENTION TIPS	3
REMEDIATION PLANNING	3
REMEDIATE MOISTURE AND MOLD PROBLEMS	3
REMEDIATION PROCEDURES	4
FOUR REMEDIATION LEVELS	4
HAZARD COMMUNICATION	9
CONCLUSION	10
REFERENCES	10
APPENDIX A: WATER DAMAGE CLEANUP AND MOLD PREVENTION	11
APPENDIX B: MOLD REMEDIATION GUIDELINES	14
APPENDIX C: PERSONAL PROTECTIVE GUIDANCE	17
APPENDIX D: CONTAINMENT GUIDANCE	19

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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.

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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.

TG 277

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 ft²) follow Level I guidance for PPE and containment and for a areas (>10 ft²) follow Medium (Level II) or when greater than 100 ft² 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.
- 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.			

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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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TG 277 ### Feb 02

£ 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				
Carpet and backing	1, 3				
Concrete or cinder block	1, 3				
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3	Minimum			
Non-porous, hard surfaces (plastics, metals)	1, 2, 3	N-95 respirator, gloves, and goggles	None required		
Upholstered furniture & drapes	1, 3				
Wallboard (drywall and gypsum board)	3				
Wood surfaces	1, 2, 3				

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TG 277 ### Feb 02

MEDIUM - Total Surface Area Affected Between 10 and 100 ft ²						
Books and papers	3					
Carpet and backing	1,3,4					
Concrete or cinder block	1,3					
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	Limited or Full Use professional judgment, consider	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area			
Non-porous, hard surfaces (plastics, metals)	1,2,3	potential for remediator exposure and size of contaminated area				
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	_				
Carpet and backing	1,3,4					
Concrete or cinder block	1,3	Full	Full			
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider potential for remediator/occupant exposure	Use professional judgment, consider potential for remediator exposure and size of contaminated area			
Non-porous, hard surfaces (plastics, metals)	1,2,3	and size of contaminated area				
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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Feb 02

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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TG 277 ### Feb 02

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 (ft²) 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

Posted to NGB FOIA Reading Room

May, 2018

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² 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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February 2002

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278 February 2002



Table of Contents

Introduction	2
Safety Tips While Investigating And Evaluating Mold And Moisture Problems	2
Communicate With Building Occupants At All Stages Of Process, As Appropriate.	3
Routine Investigation And Evaluation Of Moisture And Mold Problems	3
Assessments Requiring Sampling	3
References	4
APPENDIX A: Mold Investigation Decision Logic	5
APPENDIX B: Mold Remediation Guidelines	8
APPENDIX C: Personal Protective Equipment	11
APPENDIX D: Containment Guidance	13

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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 contamination².

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

- 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 appropriate¹.

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 problems³.

- 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 contamination².

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 air⁴. 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 Control⁴."

May, 2018

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.

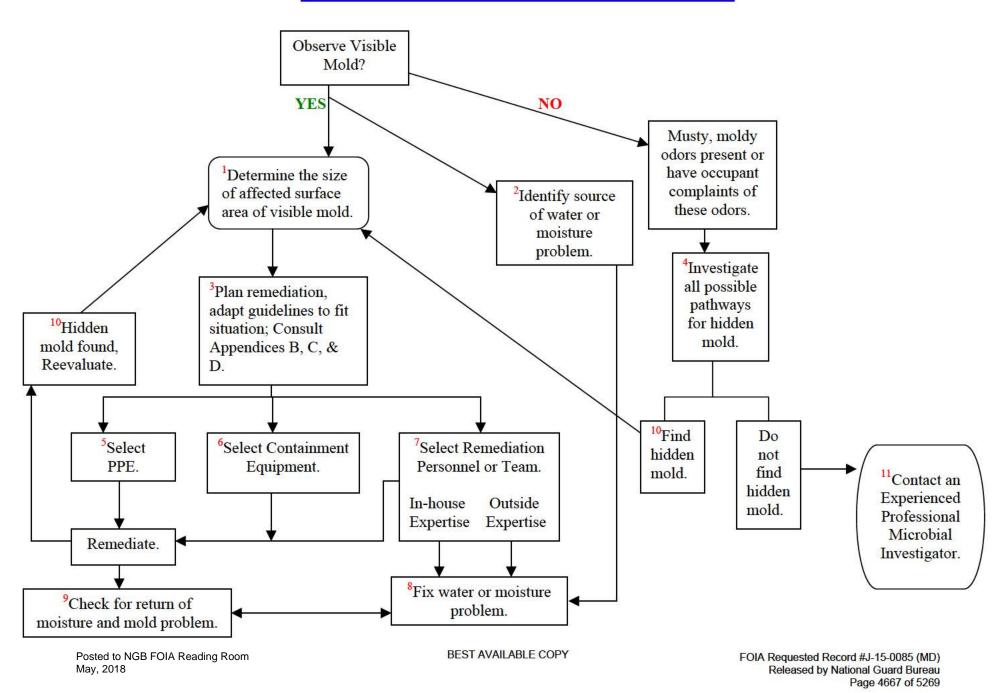
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- 2. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.
- 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



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 activities³. 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.

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				
Carpet and backing	1, 3				
Concrete or cinder block	1, 3				
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3	Minimum			
Non-porous, hard surfaces (plastics, metals)	1, 2, 3	N-95 respirator, gloves, and goggles	None required		
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				
Carpet and backing	1,3,4				
Concrete or cinder block	1,3				
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	Limited or Full Use professional judgment, consider	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated are		
Non-porous, hard surfaces (plastics, metals)	1,2,3	potential for remediator exposure and size of contaminated area			
Upholstered furniture & drapes	1,3,4				
Wallboard (drywall and gypsum board)	3,4				
Wood surfaces	1,2,3				
		face Area Affected Greater Than 100 ft ² or diator Exposure During Remediation Esti			
Books and papers	3				
Carpet and backing	1,3,4				
Concrete or cinder block	1,3	Full	Full		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider	Use professional judgment, consider		
Non-porous, hard surfaces (plastics, metals)	1,2,3	potential for remediator/occupant exposure and size of contaminated area	potential for remediator exposure and si of contaminated area		
Upholstered furniture & drapes	1,2,4				
Wallboard (drywall and gypsum board)	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.

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- 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

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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.

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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 ft² 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 Salisbury Armory

Prepared For:

National Guard Bureau Region North IH

301-IH Old Bay Lane

Havre de Grace, MD 21078

Survey Location:

Salisbury Armory

28722 Ocean Gateway Salisbury, MD 21801

Prepared By:

Analytical Laboratory Services, Inc.

3544 North Progress Avenue

Suite 100

Harrisburg, PA 17110

Survey Date:

October 28, 2010

Report Date:

December 7, 2010

ALSI Project #:

1010714

Non-Responsive

Non-Responsive CIH

Director, Environmental Health & Safety

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Table of Contents

Section 1.0 Executive Summary	3
Section 2.0 Operation Description & Observations	4
Section 3.0 Noise Survey	5
Section 4.0 Lead Testing	6
Section 5.0 Lighting	8
Section 6.0 Indoor Air Quality	9
Section 7.0 Suspect Asbestos Containing Building Materials	1
Section 8.0 Maintenance Bay	12
Section 9.0 Limitations	13
Appendix A, Laboratory Analysis Report	14
Appendix B. Photographs	15
Appendix C. Floor Plan	16
Annendix D. References	17

Section 1.0 Executive Summary

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on October 28, 2010, at the Salisbury Armory located at 28722 Ocean Gateway, Salisbury, MD 21801. The survey was performed by Mr Non-Responsive CIH.

- 1. Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft² in the basement on the heat vent. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft². Peeling and damaged paint should be repaired and properly remediated.
- 2. Lighting levels did not meet the minimum recommended guidelines in the following locations:
 - a. Kitchen
 - b. Garage
 - c. Basement Commo Room
 - d. Basement NBC Room

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 was higher than the recommended criteria of 30-60% in indoor locations. There is no central air-conditioning system in this facility. Doors and windows were open.
- 4. Water damaged ceilings and active roof leaks should be repaired. The most notable roof leak was in the front lobby. Water damaged ceiling tile should be removed and replaced.
- 5. 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

Section 2.0 Operation Description & Observations

The Salisbury Armory is mainly an administrative facility with offices, training and storage areas. There were approximately 8 full-time employees stationed at this facility at the time of this survey.

The building is scheduled to be closed and renovated in December 2010. The building was initially constructed in 1958. The exterior is brick and masonry. The interior walls are primarily concrete block and plaster. The floors are concrete with some vinyl floor tile and terrazzo floors. Offices are carpeted

There is no central heating, ventilating, and air conditioning system (HVAC) present. Outdoor air ventilation occurs via open doors and windows. Doors and windows were open during this survey. Some window air-conditioners are present. Heat is provided via a boiler-tired heating system.

There is an old firing range in the building. It was closed in the 1970's and was abated in 2007. It appears to be in good condition. It is empty and not used for any particular purpose.

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.

Section 3.0 Noise Survey

Section 3.0 Noise Survey

Employees were not performing tasks that provided excessive noise levels. Therefore, noise exposure monitoring was not conducted.

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 an office area which was once an indoor firing tange.

Various surfaces within the facility were screened for load using surface/wipe samples. Surface/wipe samples were collected in accordance with the ASTM E 1792 protocols. Bulk samples were collected of peeling paint. 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/ft ²	Paint Chip %Pb
i i	Conference Room	<8.2		
2	RHC Common Room	<8.3		<u>. </u>
3	Blank	<3 (ug)	L]
4	Lobby - Ceiling		<u> </u>	0.011
- 5	Old Firing Range - Center of Floor		<110	
6	Old Firing Range Heat Exchanger			i
· ₇	Old Firing Range - Exit Light		<110	· I
8	Entrance of Firing Range - Floor		<110	
	NBC Room - Tabletop		<110	
10	Lobby Floor		<110	
	Kitchen Countertop		<110	T
ι2	Drill Hall Floor		<110	Ţ·
t3	Basement - Heat Vent		2,000	
14	HHC Common Room Table		<110	
15	Blank		<(2 (ug)	
Criteria		50	200	0.5

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)

Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft² on the basement heat vent. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft². Peeling and damaged paint should be repaired and properly remediated.

The National Guard Bureau currently utilizes 200 ug/ft² 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

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Medicine (USACHPPM) has determined that 200 ug/ft² 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/ft² on floors and 250 ug/ft² 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/m³. In fact, no detectable level of lead was identified in the air samples collected.

Deteriorated paint was observed in a few locations throughout the facility. Delaminated paint was mostly due to water leaks and age along with prolonged exposure to elevated relative humidity levels. A paint chip sample was collected from peeling paint in the lobby where a water leak was present. This paint was found to be 0.011% lead. This is below the HUD definition of lead-based paint (0.5%).

Section 5.0 Lighting

Section 5.0 Lighting

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

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Conference Room	85.8	30-50	Yes
Second Floor Office	91.1	30-50	Yes
Copy Room/Office	75.6	30-50	Yes
Drill Hall	50 - 100	30-50	Yes
Kitchen	21.5	30-50	No
Locker Room	52.3	! 7	Yes
Storage Room	52.7	30	Yes
S-4 Office	83.1	30-50	Yes
Garage	65	75	No
Orderly Room/Office	38.3	30-50	Yes.
Old Firing Range (Storage)	72.5	30	Yes
Basement - Commo Room			İ
(Storage)	11.3	30	<u>No</u>
Basement - NBC Room			'
(Storage)	9.0	30	<u>No</u>

Lighting levels did not meet the minimum recommended guidelines in the following locations:

- 1. Kitchen
- 2. Garage
- 3. Basement Commo Room
- 4. Basement NBC Room

Lighting should be improved in these areas.

Section 6.0 Indoor Air Quality

Section 6.0 Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (earbon dioxide, temperature, and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 8554 (Serial #02041013). The IAQ Meter was last calibrated in Sept 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 70.3 to 73.4 degrees F with relative humidity readings ranging from 64.9% to 89.1%. During the survey, carbon dioxide (CO₂) levels ranged from 313 ppm to 528 ppm within the facility compared to an outdoor CO₂ level of 321 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO₂ recommended is 1,021 ppm (321 ppm - 700 ppm). Carbon monoxide (CO) was 0 ppm in all locations tested.

The following table summarizes the measurements collected.

	1AQ Assessment	Summary		
Location	Temperature (*F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	72.5	88.2	347	0.0
Conference Room	70.3	71.6	465	0.0
Second Floor Office	72.5	87.0	459	0.0
Copy Room/Office	73.0	81.0	431	0.0
Drill Hall	72.3	89.1	396	0.0
Kitchen	72.5	88.8	413	0.0
Locker Room	72.3	86.1	362	0.0
Storage Room	71.6	83,3	390	0,0
S-4 Office	72.3	64.9	406	0.0
Garage	73.4	87.7	368	0.0
Orderly Room/Office	73.2	78.6	528	0.0
Old Firing Range (Storage)	72.0	82.5	313	0.0
Basement Commo Room	72.0	81.5	323	0.0
Basement NBC Room	71.4	82.2	326	0,0
Outdoors	72.1	86.0	294	0.0
Criteria	68.0-79.0	30-60	<1,021	<9.0

Key: Bolded results exceed listed criteria

Source: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2004 & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Relative humidity was higher than the recommended criteria of 60% in many indoor locations. Many windows and doors were open. It was humid outdoors on the day of survey.

Carbon dioxide levels did not exceed the recommended ceiling of 1,021 ppm. This suggests that outdoor air ventilation is adequate in this area. There is no mechanical ventilation system in this facility. Outdoor air ventilation occurs through open doors and windows.

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. Water damaged ceilings and active roof leaks are present in a few areas. The most notable area was the front lobby where a water leak from the second floor shower was present. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

Section 7.0 Suspect Asbestos Containing Building Materials

Section 7.0 Suspect Asbestos Containing Building Materials

Suspect asbestos containing materials (ACM) include sheetrock/joint compound, plaster wall and ceiting 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 was suspected. No samples were collected. Inaccessible areas were not inspected.

The following are the most notable findings regarding suspect ACM at the time of this survey:

- 9" x 9" black, brown, green and tan floor tile and mastic are present in the facility. Approximately 10,000 ft² was observed. Floor tile appeared to be in good condition.
- 2. If x 1° ceiling tile were observed throughout the facility. This appeared to be in good condition throughout the facility except a small area of the lobby where a water leak was present. This water leak should be repaired.

Section 8.0 Maintenance Bay

Section 8.0 Maintenance Bay

There is a garage area at this facility. It was previously used for vehicle maintenance but is now used only for storage. There is a Local Exhaust Ventilation (LEV) system or overhead vehicle exhaust system present to remove vehicle exhaust from the building during vehicle maintenance. The LEV system contains four drops however two drops are in a state of disrepair and could not be evaluated. Ventilation measurements were conducted from Bays 2 and 4. The LEV in each bay consists of a flex duct with a diameter of 5.5". The following flow rates were measured:

- Bay 2 169 CFM
- 2. Bay 4 133 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 (27th Edition).

The overhead vehicle exhaust should be repaired and utilized if vehicle maintenance activity occurs that involves operation of vehicles inside the building.

Section 9.0 Limitations

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.

Appendix A Laboratory Analysis Report

Page 1 of 2

Summary of Atomic Absorption Analysis for Lead

11/8/2010

NY FLA



and Analytical Services, Inc.

A Specialized Environmental Laboratory

					Non-	Attentions
11/8/2010 Report Date:	11/8/2010	Date Analyzedi	W912K6-09-A-0003	P,O, Number:		
Non-Re		Person Submitting:	Not Provided	Job Number:	Havre de Grace, Maryland 21078.	
•	0102/1/11	Date Submitted:	Salishary Armory	Job Location:	301-IH Old Bay Lane, Afm: NGB-AVN-SI, State Military Reservation	Address
	509114	Chain Of Custody:	Saitsbury, Armery	Job Name:	National Cuard Bureau	Cilent

AMA Szauple Number	Client Sample Namber	Analysis Lyne	Sample Type	Air Volume (L)	Area Wiped (07)	Rep F	Reporting Linit	Total ng	Final Result		Comments
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1110305	1010714-2	Flame	Air	362	N/A	60	ug/m³	77.	<8.3 8.3	ug/m³	
1110307	1010714-3	Flamo	Air Blank	Q	NA	·έn	*สห <i>ั</i> ยท		Ø	MS SM	
1110308	1010714-4	Flane	Paint Chip	本本集条	N/A	0.0077	%Pb		0.011	4%	
1110309	1010714-5	Flame	Wipe	***	801.0	011	ug/ff2	×12	Ø. ₽	理/作	
1110310	1010714-6	Plane	Wipe	****	6.108	110	ng/it?	77	<110	ng/ft²	
1160311	1010714-7	Flame	Wips	****	0.108	110	u g/ft?	×12	9	ug/Rr	
1110312	1010714-8	Florence	Wipe	***	0.108	011	-AJ/An	<12	0T>	ug/ff²	
1110313	1019714-9	Fiante	Wipe	****	0.108	110	ug/fit	<12	017	ug/ff²	
1110314	1010714-10	Flame	Wipe	***	0.108	110	ugitte	1 13	0110	116/H2	
110315	1010714-11	Папе	Wipe	***	0,108	110	ug/M²	<12	□ □ □	ug/ff²	
3,10316	1010714-12	Flame	Wige	婚安安安	0.108	110	ng/ff²	<12	A L	ug/ff ²	
1110317	1010714-13	Flante	Wipe	****	0.108	011	ug/ff?	210	2000	ug/ff²	
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CERTIFICATE OF ANALYSIS



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1011	11/8/2010 Report Date: 11/8/2010.		Page 2 of 2
Person Submitting	Date Analyzed:		Summary of Atomic Absorption Analysis for Lead
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Havre de Grace, Maryland 21078		Non-Re	50 0

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Final Result	See QC Summary for ahalytical results of quality control samples associated with these sampes. NY EAP accreditation applies only to paint chip, wipe, and soil samples.
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Analysis Type

Client Sample

AMA Sample

Number

Attentions

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 ug = micrograms Analysis Method For Furnace: Alr, Wipes, Paint mg/Kg = parts per m Analysis Method for Flamer Air, Wipes, Paints, %Pb = percent lead on a dry weight basis N/A = Not Applicable

Air and Wipe results are not corrected for any blank results All results are to be considered prefiningly and subject to change unless signed by the Technical Director or Deputy. Final results for air and wipe samples are based on client supplied information nor verified by this laboratory,

should not be considered when interpreting the result.



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Address: Client

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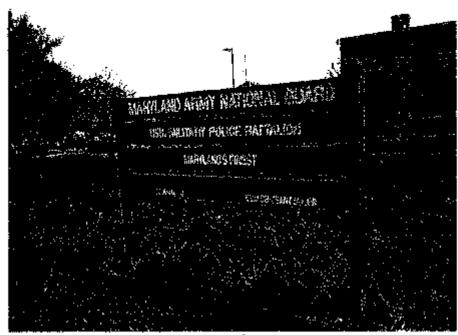
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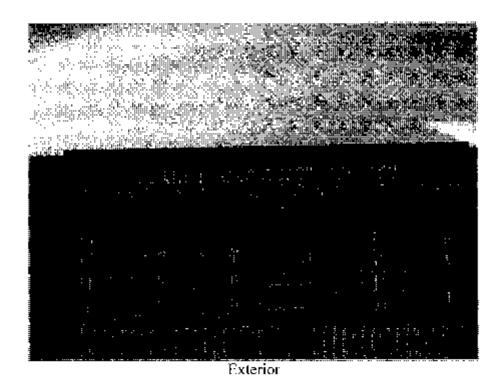
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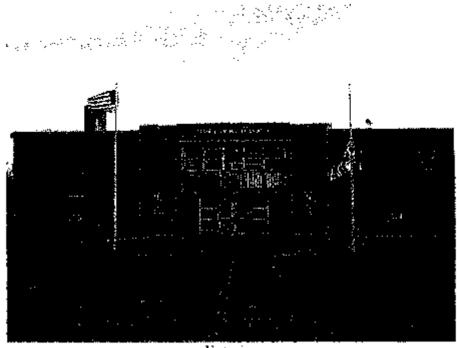
Appendix B Photographs



Exterior



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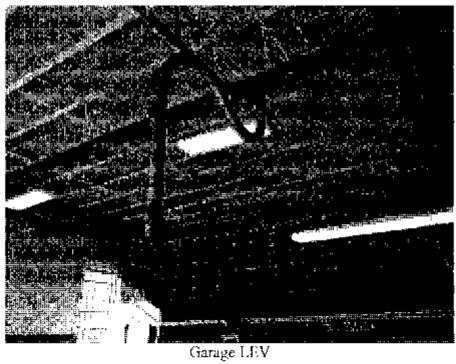
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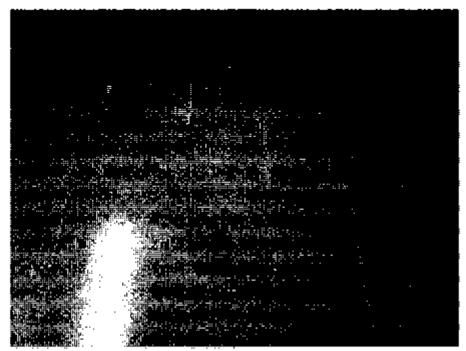


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Typical Vinyl Floor Tile (VET):



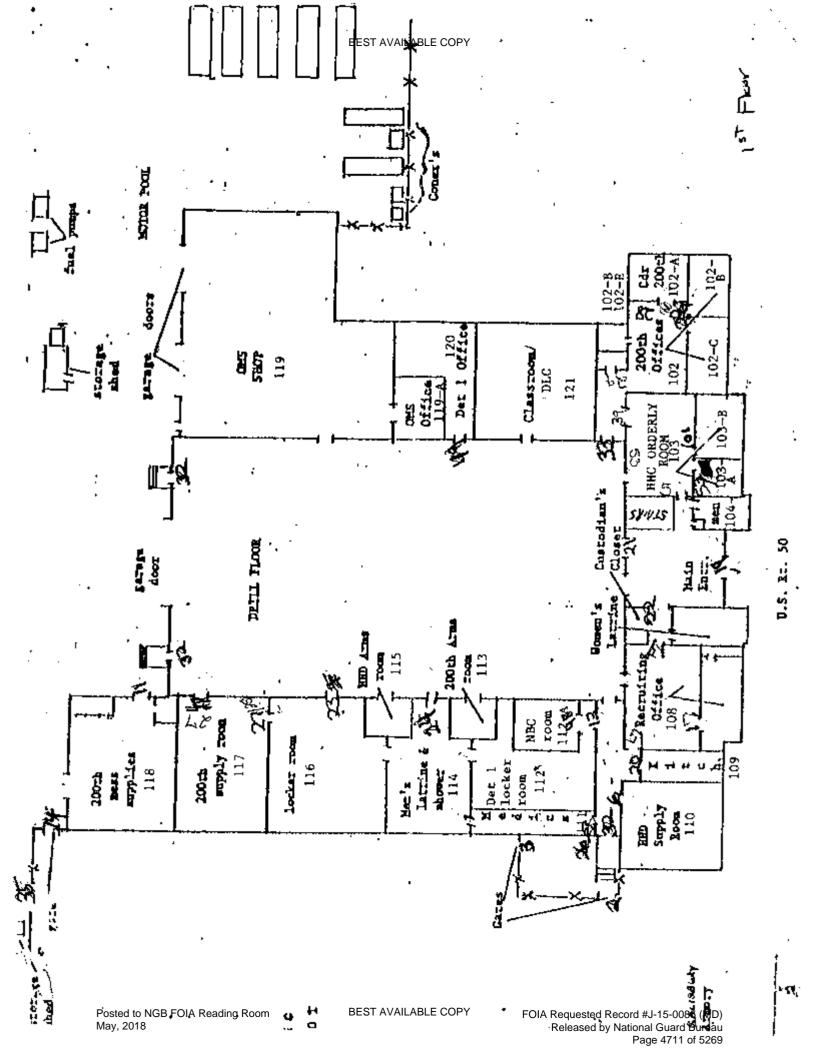


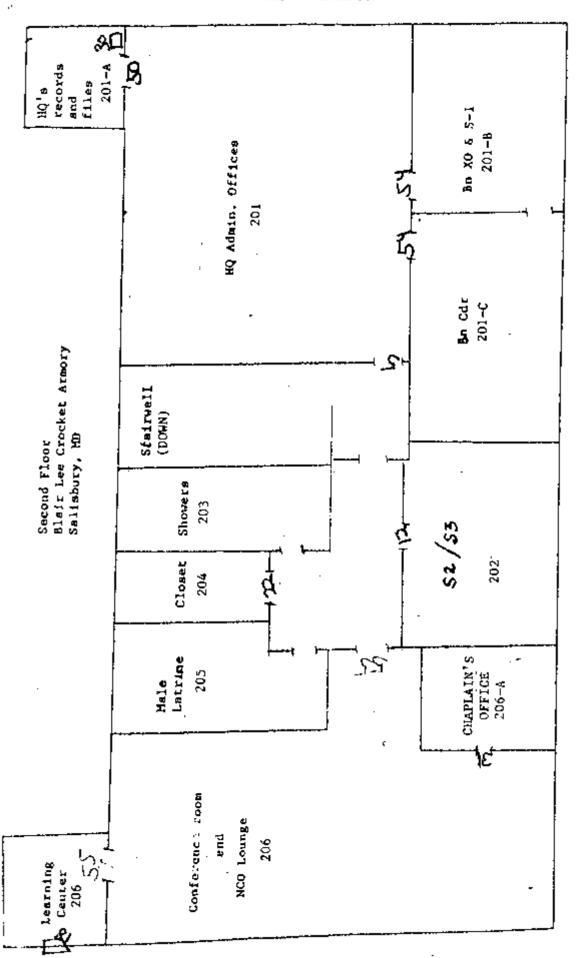
Old Firing Range

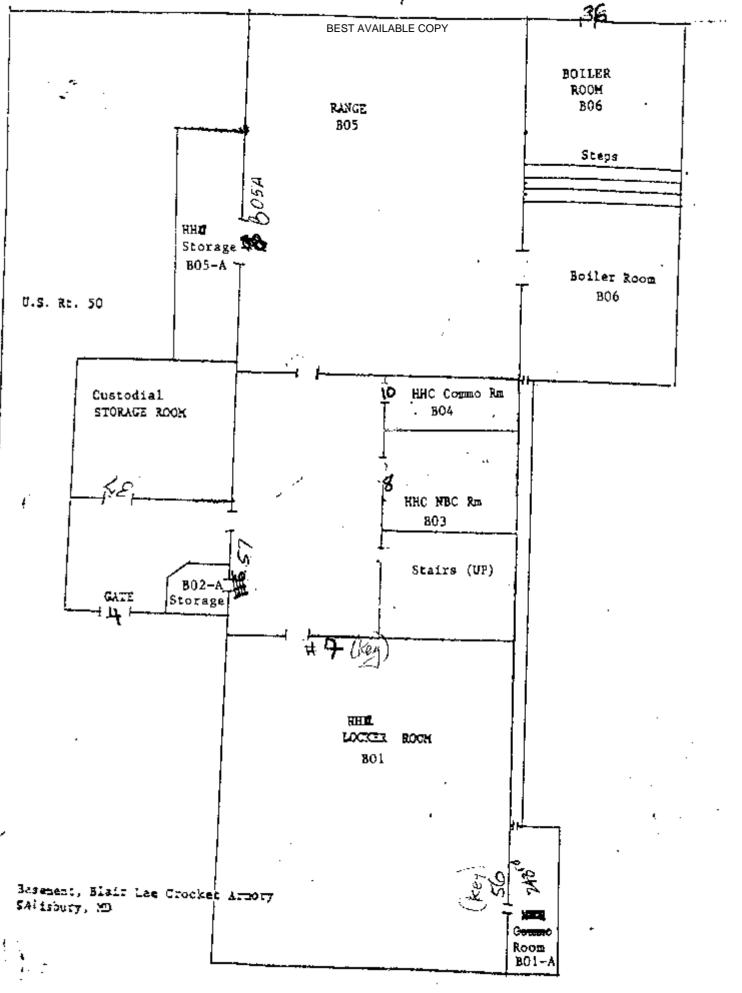


Boiler Room

Appendix C Floor Plan







Appendix D References

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 (ACGIA) 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
- 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
- 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)]
- 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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Industrial Hygiene Survey Report

National Guard Facility Salisbury City Readiness Center

Prepared For: National Guard Bureau Region North IH

301-IH Old Bay Lane

Havre de Grace, MD 21078

Survey Location: Salisbury Readiness Center

28722 Ocean Gateway Salisbury, MD 21801

Prepared By: Compliance Management International, Inc.

1215 Manor Drive

Suite 205

Mechanicsburg, PA 17055

Survey Date: June 18, 2013

Report Date: July 12, 2013



Non-Responsive

Manager, Industrial Hygiene Services

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Table of Contents

Section 1.0 Executive Summary	3
Section 2.0 Operation Description & Observations	4
Section 3.0 Lead Testing	5
Section 4.0 Lighting	7
Section 5.0 Indoor Air Quality	9
Section 6.0 Suspect Asbestos Containing Building Materials	11
Section 7.0 Equipment	12
Section 8.0 Limitations	13
Appendix A. Laboratory Analysis Report	14
Appendix B. Photographs	15
Appendix C. Floor Plan	16
Appendix D. References	17

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on June 18, 2013, at the Salisbury Readiness Center located at 28722 Ocean Gateway, Salisbury, MD 21801. The survey was performed by Mr. Non-Responsive

- 1. Lead surface and air samples were collected. All results were less than recommended guidelines. 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 Mechanical Room 002. 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 measured indoors exceeded 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 (CO₂₎ 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.

Section 2.0 Operation Description & Observations

The Salisbury Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, and a converted firing range area (currently the Distance Learning Center). There were approximately 4 full-time employees stationed at this facility at the time of this survey. There are two travelling maintenance personnel assigned to the building.

The building is reported to have been built in the 1950s. Major renovation and an addition were completed in 2012. It is a two-story structure with a basement. The exterior is brick and block. The interior walls are brick, block, and drywall. The floors are concrete, 12"x12" floor tiles, terrazzo, and ceramic tile.

The heating system is unknown. A rooftop central A/C system exists.

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 distance learning center.

No suspect asbestos containing material (ACM) was observed.

No chipped or peeling paint were observed.

This facility has a Field Maintenance Shop (FMS) unit on the property which is not attached.

Housekeeping is very good.

During Hurricane Sandy, water entered the building through windows in several areas.

During this survey, the Drill Hall doors were propped open allowing warm, moist air to enter the building.

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	<6.2	*
2	Recruiting Office	<6.1	*
3	Blank	<3 ug	*
4	Blank	*	<12 ug
5	Drill Hall Floor Center	*	<110
6	Drill Hall Microwave Top	*	<110
7	Kitchen Ice Maker Top	*	<110
8	Supply Room Cabinet Top	*	<110
9	Gym Window Sill	*	<110
10	Break Room Vending Top	*	<110
11	CFR Floor	*	<110
12	CFR Outside Entrance Floor	*	<110
13	CFR Cabinet Top	*	<110
14	Admin Office Bookshelf Top	*	<110
15	2 nd Floor Corridor Floor	*	<110
16	Room 205F Safe Top	*	<110
17	Room 206 File Cabinet Top	*	<110
18	Classroom 202 Window Sill	*	<110
19	Recruiting Office shelf Top	*	<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:

- 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/ft²) 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/ft² on floors and 250 ug/ft² 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 less than the recommended guideline of 200 ug/ft² 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/m³).

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	Recommended	Sufficient
	(FC)	Lighting (FC)	Lighting
Drill Hall	35.3	10	Yes
Lobby	44.9	10	Yes
Classroom (CR) 103A	31.5	30-50	Yes
CR 103B	33.6	30-50	Yes
CR Corridor	12.0	5	Yes
Men's Latrine	88.0	5	Yes
Men's Locker Room	25.8	7	Yes
2 nd Floor Corridor	24.5	5	Yes
Office 205H	30.0	30-50	Yes
Office 205	37.3	30-50	Yes
Telecomm Room (not repair)	39.4	30-50	Yes
Men's Latrine	99.7	5	Yes
Women's Latrine	68.6	5	Yes
2 nd Floor CR Corridor	63.5	5	Yes
CR 202C	50.1	30-50	Yes
Office 204	41.9	30-50	Yes
Library/CR	33.1	30-50	Yes
Basement Corridor	85.3	5	Yes
Mechanical Room 003	30.7	30	Yes
Men's Latrine	15.1	5	Yes
Women's Latrine	9.1	5	Yes
CR 011	53.7	30-50	Yes
Mechanical Room 006	66.7	30	Yes
Mechanical Room 002	20.9	30	No
Office 101	40.3	30-50	Yes
Lobby B	96.1	10	Yes
Office 119	97.2	30-50	Yes
2 nd Floor Break Room	49.2	10	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.

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The lighting levels did not meet the minimum recommended guideline in Mechanical Room 002. Lighting should be improved in this area.

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	76.9	91.3	372	0.0
Office 204	73.1	74.4	451	0.0
Office 119	73.7	70.1	715	0.0
Criteria	68-79	30-60	<1,072	<9

Table Notes:

- 1. **Bolded** results exceed listed criteria
- 2. **ppm** = parts per million
- 3. (%) = percent relative humidity
- 4. ${}^{\circ}\mathbf{F} = \text{degrees Fahrenheit}$

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 were above the recommended guideline of 30 60 % in all indoor areas sampled. Relative humidity should remain within the recommended guideline of 30% to 60%. It should be noted that Drill Hall doors were propped open during the site survey allowing warm, moist air to infiltrate the facility. This is likely the reason for the elevated relative humidity measurements.

- 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 1,072 ppm (700 ppm + 372 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 only significant observation noted was that during rainstorms water reportedly flows down the outside stairwell into the basement. This area has a damp, musty odor.

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	6/17/13	2.49 LPM
SKC Air Sampling Pump	767926	6/17/13	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

AMA Analytical Services, Inc.

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS



LAB #100470

Client:

National Guard Bureau

Job Name:

ARNG 4a MD

Chain Of Custody:

516190

Address:

301-IH Old Bay Lane, Attn: ARNG-CJG-P,

Job Location:

Salisbury

Date Submitted:

6/25/2013

State Military Reservation

Job Number:

Not Provided

Person Submitting:

Havre de Grace, Maryland 21078

P.O. Number:

W912K6-09-A-0003

Date Analyzed:

7/1/2013

7/1/2013 Report Date:

Attention:

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)		oorting Limit	Total ug	Final Res	ult	Comments
13073141	1	Flame	Air	486	N/A	6,2	ug/m³	<3	<6.2	ug/m³	
13073142	2	Flame	Air	488	N/A	6.1	ug/m³	<3	<6.1	ug/m³	
13073143	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13073144	4	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13073145	5	Flame	Wipe	****	0.108	110	ug/fl²	<12	<110	ug/ft²	
13073146	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073147	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073148	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073149	9	Flame	Wipe	****	0.108	110	ug/fl2	<12	<110	ug/ft²	
13073150	10	Flame	Wipe	****	0.108	110	ug/fl2	<12	<110	ug/ft²	
13073151	11	Flame	Wipe	****	0.108	110	ug/fl²	<12	<110	ug/ft²	
13073152	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073153	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073154	14	Flame	Wipe	***	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073155	15	Flame	Wipe	***	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073156	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073157	17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073158	18	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073159	19	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	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. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AHIA, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

An AIHA (#100470) and Ext. AVAR (#10220) Accredited Laboratory

AMA Analytical Services, Inc.

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS



LAB #100470

Client:

National Guard Bureau

Job Name:

ARNG 4a MD

Chain Of Custody:

516190

Address:

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Job Location:

Salisbury

Date Submitted:

6/25/2013

State Military Reservation

Not Provided

Person Submitting:

Havre de Grace, Maryland 21078

Job Number: P.O. Number:

W912K6-09-A-0003

Date Analyzed:

associated with these

samples.

7/1/2013

Report Date:

7/1/2013

Attention:

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample

Client Sample

Analysis Type

Sample Type

Air Volume

Area Wiped

Reporting

Total ug

Final Result

See QC Summary for analytical results of quality control samples

Comments

Number

Number

(L)

(ft2)

Limit

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

ug = micrograms

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/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.

Posted to NGB FOIA Reading Room

Analyst

Technical Manager:

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. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AIHA, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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OWI (410) 247-2024

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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)

516190

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Appendix B. Photographs



Salisbury RC



Drill Hall



Boiler Room



Outside Stairwell



Standing Water in the Outside Stairwell

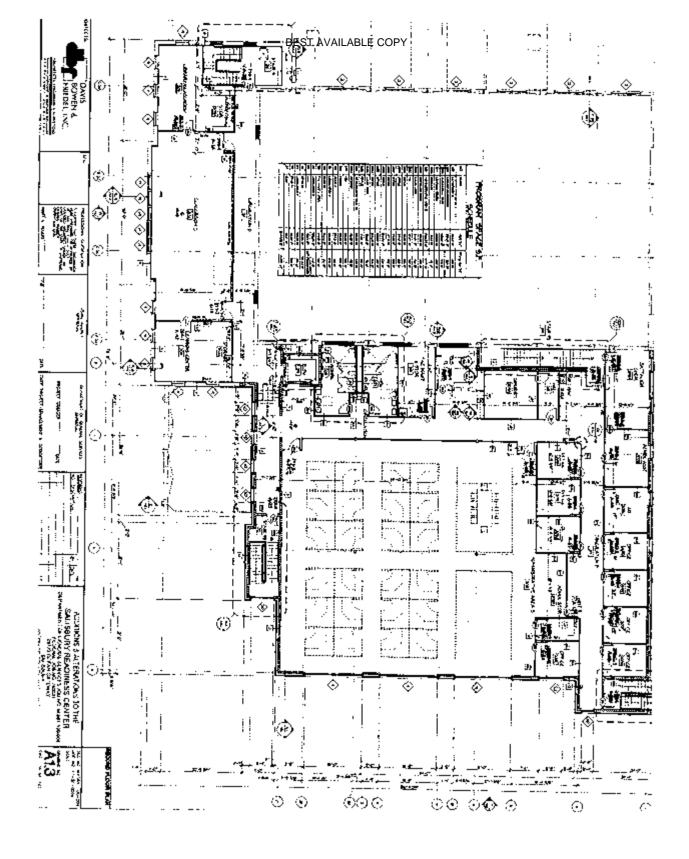


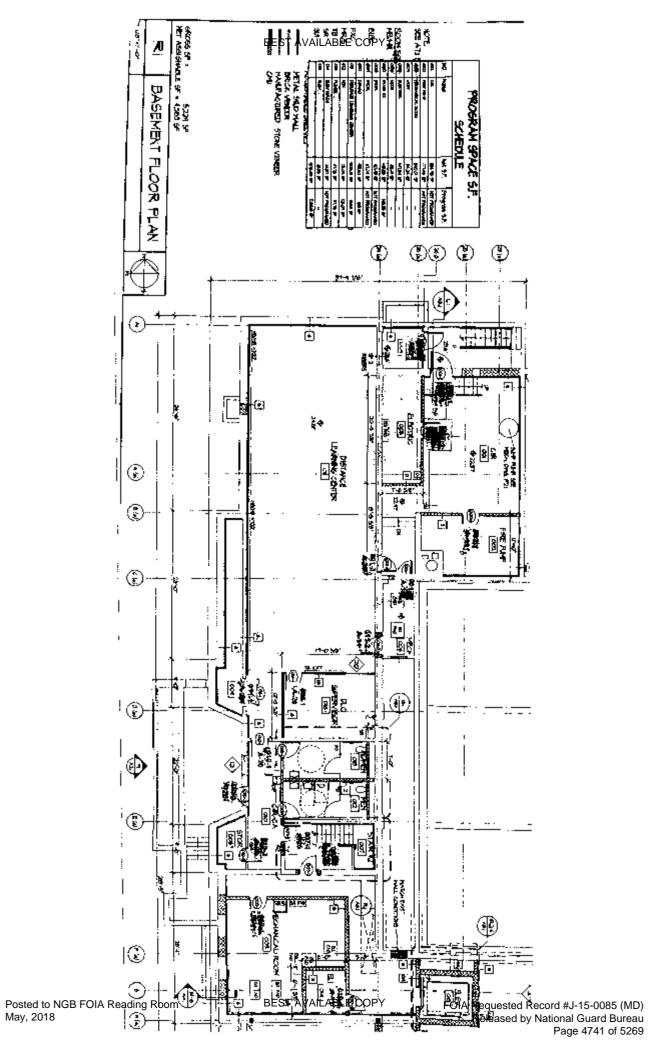
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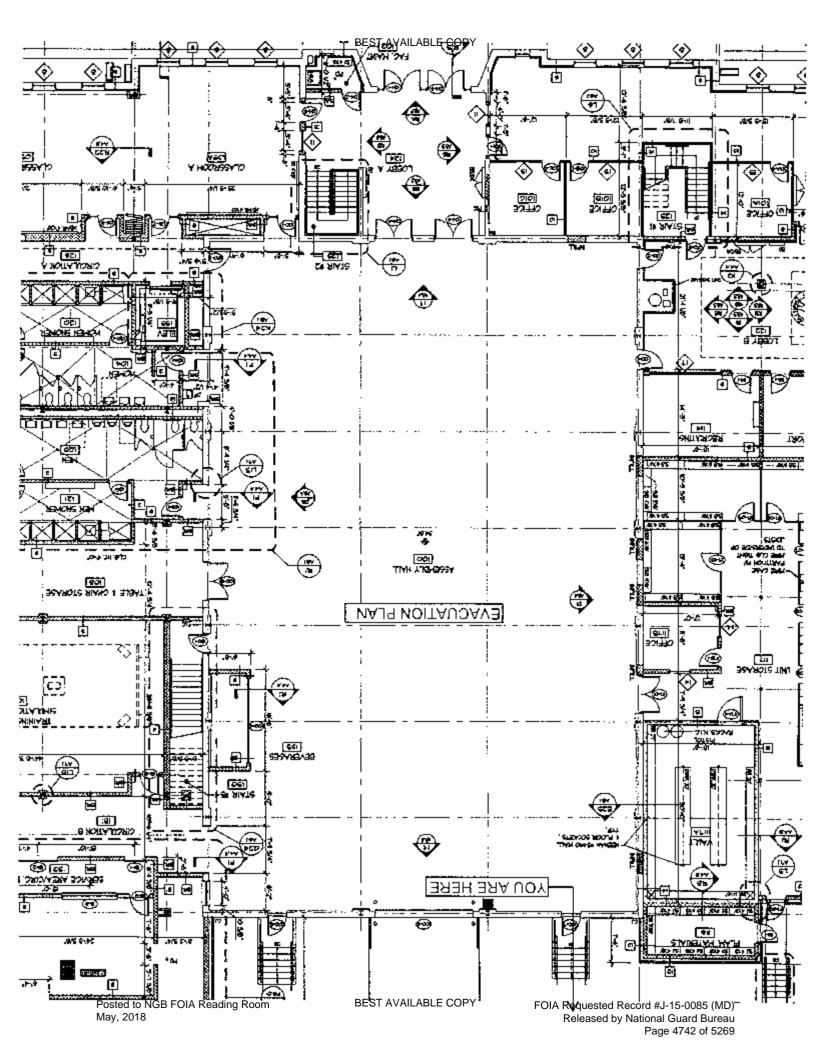


Open Drill Hall Door

Appendix C. Floor Plan







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

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

SUBJECT: Maryland Army National Guard Facilities, Industrial Hygiene Baseline Survey, MG George M. Gelston Armory, Silver Spring, MD, Report No. 55-ML-01ED-03/07, 5 August 2003

- 1. Enclosed is the final copy of the subject report and two CD-ROMs.
- 2. Our point of contact is Ms. Non-Responsive at commercial (410) 436-5475/3118, DSN 584-5475/3118, or electronic mail: Non-Responsive @us.army.mil.

FOR THE COMMANDER:

Non-Responsive

Encl

CF: (wo/CD-ROMs)
USACHPPM-NORTH (MCHB-AN-IH/MR. Non-Responsive

Readiness thru Health



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



INDUSTRIAL HYGIENE BASLEINE SURVEY
REPORT NO. 55-ML-01ED-03/07
MARYLAND ARMY NATIONAL GUARD FACILITIES
MG GEORGE M. GELSTON ARMORY
SILVER SPRING, MD
5 AUGUST 2003











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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.



DEPARTMENT OF THE ARMY

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

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EXECUTIVE SUMMARY
INDUSTRIAL HYGIENE BASELINE SURVEY
REPORT NO. 55-ML-01ED-03/07
MARYLAND ARMY NATIONAL GUARD FACILITIES
MG GEORGE M. GELSTON ARMORY
SILVER SPRING, MD
5 AUGUST 2003

- 1. PURPOSE. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) MG George M. Gelston Armory, Silver Spring, MD, 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.
- 2. CONCLUSIONS. The significant health and safety concerns were: surface lead levels in one area of the former indoor firing range (IFR) and in one office; a potential presence of asbestos pipe insulation; leaks causing mold growth; and the lack of written Occupational Safety and Health (OS&H) programs.

3. RECOMMENDATIONS.

- a. <u>Lead Exposure</u>. Adult exposure: Health RAC (Risk Assessment Code) 3; Child Exposure: Health RAC 4.
- (1) Clean the former IFR and other areas where sampling results showed elevated levels of lead. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. See Appendix D of the report and National Guard Pamphlet 420-15 for lead cleaning guidance.
- (2) Discontinue advertising this facility for use by young children. Address all potential lead hazards before continuing to extend this facility for use by children. If children will continue to use this facility, clean surfaces to the Environmental Protection Agency lead in dust standard for young children and clean all remaining areas to the National Guard Bureau Region North Industrial Hygiene Office and United States Army Center for Health Promotion and Preventive Medicine maximum level for lead on frequently contacted surfaces.

Readiness thru Health



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EXSUM, MDARNG Facilities, Industrial Hygiene Baseline Survey, MG George M.Gelston Armory, Silver Spring, MD, Report No. 55-ML-01ED-03/07, 5 August 2003

- b. <u>Asbestos</u>. No RAC can be assigned. Review records to determine whether an asbestos survey has been performed. If not, perform an asbestos survey. If asbestos is identified, develop and implement an Asbestos Management Plan.
- c. <u>Mold Exposure</u>. Health RAC 4. Abate all areas of visible mold. Remove and replace ceiling tiles that have mold growth. Follow the guidance in Appendix E of the report.
- d. OS&H Programs. No RAC can be assigned. Locate and review site-specific OS&H programs. If these are outdated or do not exist, develop and implement new ones.

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MDARNG Facilities, Industrial Hygiene Baseline Survey, MG George M. Gelston Armory, Silver Spring, MD, Report No. 55-ML-01ED-03/07, 5 August 2003

CONTENTS

Paragraph	Page
1. REFERENCES	1
2. PURPOSE	1
3. AUTHORITY	1
4. GENERAL	1
5. METHODOLOGY	2
6. FINDINGS AND DISCUSSION	2
7. CONCLUSIONS	4
8. RECOMMENDATIONS	4
9. ADDITIONAL ASSISTANCE	5
APPENDICES	
A. REFERENCES	A-1
B. PHOTOGRAPHS	B-1
C. FLOOR PLAN	C-1
D. LEAD ASSESSMENT CRITERIA	D-1
E. LABORATORY REPORTS	E-1
F. LEAD CLEANING GUIDANCE	F-1
G MOLD CLEANING GUIDANCE	G-1

INDUSTRIAL HYGIENE BASLEINE SURVEY REPORT NO. 55-ML-01ED-03/07 MARYLAND ARMY NATIONAL GUARD FACILITIES MG GEORGE M. GELSTON ARMORY SILVER SPRING, MD 5 AUGUST 2003

- 1. REFERENCES. See Appendix A.
- 2. 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 (MDARNG) MG George M. Gelston Armory, Silver Spring, MD. 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. Non-Responsive), 28 February 2003, subject: SAB.
- 4. GENERAL.
- a. <u>Personnel Contacted</u>. SGM Non-Responsive, White Oak Armory, 12200 Cherry Hill Road, Silver Spring, MD 20904-1690. Mr. Non-Responsive, who had been the Armory caretaker for thirty-five years, supplied additional information on building maintenance.
- b. <u>Survey Personnel</u>. This survey was conducted on 5 August 2003 by Ms Non-Responsive, Industrial Hygienist, United States Army Center for Health Promotion and Preventive Medicine (USACHPPM).
- c. <u>Risk Assessment Codes (RACs)</u>. The Department of Defense 6055.1 Instruction (DODI) provides a method for assigning RACs to health hazards that is 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 one to five, with one being the highest priority.

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.

d. <u>Background</u>. The Armory was built in 1971. The mission was support for the 1st BN, 115th Infantry Regiment, which was deployed at the time of the site visit. The Armory included a Drill hall, a Classroom, offices, and storage spaces. The point of contact stated that children occasionally visited the Drill Hall and Classroom for family support meetings. At the time of the site visit, the Armory was being advertised as available for rent for activities that could include young children. Photographs are provided in Appendix B and a floor plan in Appendix C.

5. METHODOLOGY.

- a. <u>Assessment Criteria</u>. 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 D. 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. <u>Calibration</u>. All instruments were calibrated in accordance with manufacturers' instructions using National Institute of Standards and Testing traceable method.
- c. <u>Methodology</u>. 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. FINDINGS AND DISCUSSION.

- a. <u>Description of Operations</u>. The Armory contained a Drill Hall, a Classroom, offices, and storage spaces.
- b. <u>Occupational Safety and Health (OS&H) Programs</u>. No records of OS&H programs could be found.
- c. <u>Building Condition</u>. The buildings had been well maintained and were generally in good condition except for leaks in the ceilings of several areas of the Armory building. The building caretaker stated that the water was entering through the kitchen vent rather than through the roof.

d. Indoor Environmental Quality.

- (1) Heating, Ventilation, and Air-Conditioning Systems. The Armory had a central gasfired heating and air-conditioning system. The ductwork on the personnel side of the Armory had been professionally cleaned in 2003.
- (2) Mold. Mold was growing on ceiling tiles in the classroom due to the leaks described above.

e. Lead Hazards.

- (1) Criteria for lead in surface dust. 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 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 CPL 02-02-58. Further information is provided in Appendix D.
- (2) Results for Lead in Dust. The laboratory report is in Appendix E. The results are shown in the Table on the next page. Two measurements, highlighted in the Table, exceeded the USACHPPM and EPA criteria. These were both in the Locker Room (former indoor firing rang (IFR)). Lead abatement had been conducted in the former IFR, but it had not been completely cleaned. Personnel using the Locker Room were potentially exposed to lead, and could have been tracking it into adjacent rooms in the Armory. This could result in lead exposures for children visiting the facility and for the general workforce.

TABLE. Lead in Surface Dust Wipe Locations and Analytical Results.

Wipe Sample #	<u>-</u>							
		$(\mu g/ft^2)$						
SP W01	Personnel Service Office (SGT Non-Responsive wall next to window	<23						
SP W02	Room 102-A (S-1 Office, LT), floor in corner	<23						
SP W03	Room 103A (S-3 Office, SGM windowsill	157						
SP W04	SGT Non-Responsive office, desk top	<23						
SP W05	Former IFR ceiling, supply plenum	41						
SP W06	Former IFR, floor next to door	512						
SP W07	Supply Room floor	35						
SP W08	Weight Room floor off male latrine	<23						
SP W09	Drill Floor, deteriorated paint near supply room	<23						
SP W10	Drill Floor, wall near kitchen	<23						
SP W11	OMS Shop floor	<23						
SP W12	OMS Bay 3 floor	<23						
SP W13	OMS Bay 2, top of toolbox	<23						

- f. Other Chemical Hazards. Asbestos. The age of the building made the presence of asbestos possible. There was no knowledge of abatement work, and we observed pipe insulation that was possibly asbestos-containing material.
- 7. CONCLUSIONS. The significant health and safety concerns were: surface lead levels in one area of the former IFR and in one office; a potential presence of asbestos pipe insulation; leaks causing mold growth; and the lack of written OS&H programs.

8. RECOMMENDATIONS.

- a. <u>Lead Exposure</u>. Adult exposure: Health RAC 3; Child Exposure: Health RAC 4.
- (1) Clean the former IFR and other areas where sampling results showed elevated levels of lead. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. See Appendix D and National Guard Pamphlet 420-15 for lead cleaning guidance.

- (2) Discontinue advertising this facility for use by young children. Address all potential lead hazards before continuing to extend this facility for use by children. If children will continue to use this facility, clean surfaces to the EPA lead in dust standard for young children and clean all remaining areas to the NGB Region North Industrial Hygiene Office and USACHPPM maximum level for lead on frequently contacted surfaces.
- b. <u>Asbestos</u>. No RAC can be assigned. Review records to determine whether an asbestos survey has been performed. If not, perform an asbestos survey. If asbestos is identified, develop and implement an Asbestos Management Plan.
- c. <u>Mold Exposure</u>. Health RAC 4. Abate all areas of visible mold. Remove and replace ceiling tiles that have mold growth. Follow the guidance in Appendix E.
- d. <u>The OS&H Programs</u>. No RAC can be assigned. Locate and review site-specific OS&H programs. If these are outdated or do not exist, develop and implement new ones.
- 9. ADDITIONAL ASSISTANCE. For additional assistance or questions concerning this report, please contact the undersigned at commercial (410) 436-5474/3118, DSN 584-5474/3118 or electronic mail: Non-Responsive @us.army.mil

Non-Responsive

Non-Responsive

M.S.

Industrial Hygienist
Industrial Hygiene Field Services Program

APPROVED:



Major, Medical Service Corps Program Manager Industrial Hygiene Field Services Program

APPENDIX A

REFERENCES

- 1. Occupational Safety and Health Administration (OSHA), Title 29 Code of Federal Regulations Part 1910, cur rented. http://www.osha.gov/comp-links.html
- 2. EPA, 40 CFR Part 745, Lead; Identification of Dangerous Levels of Lead; Final Rule, 5 Jan 2001.
- 3. 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
- 4. National Guard Pamphlet 420-15, Facilities Engineering, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.

APPENDIX B

PHOTOGRAPHS

Photograph Number	Location
1	Personnel Service Office (SGT wall next to window (Wipe sample)
2	Room 102-A (S-1 Office, LT), floor in corner (Wipe sample)
3	Recruiter's Office, mold growth on tiles
4	Room 103A (S-3 Office, SGM windowsill (Wipe sample)
5	SGT Non-Responsive office, desk top (Wipe sample)
6	Locker Room (Former IFR) ceiling, supply air plenum (Wipe sample)
7	Corridor, floor next to door to former IFR (Wipe sample)
8	Supply Room floor (Wipe sample)
9	Weight Room floor off male latrine (Wipe sample)
10	Classroom ceiling, mold growth on tile
11	Drill Hall, deteriorated paint near supply room/(Wipe sample)
12	Drill Hall wall near kitchen/(Wipe sample)
13	Drill Hall ceiling (Bulk paint sample)
14	Ceiling leak, typical of several locations in Armory
15	OMS shop floor (Wipe sample)
16	OMS Bay 3 floor (Wipe sample)
17	OMS Bay 2, top of toolbox (Wipe sample)



Photograph 1.



Photograph 3.



Photograph 2.



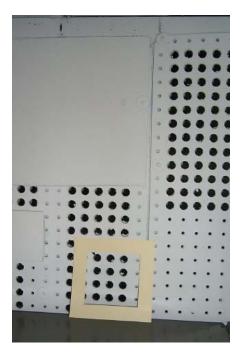
Photograph 4.



Photograph 5.



Photograph 7.



Photograph 6.



Photograph 8.



Photograph 10.





Photograph 11.



Photograph 12.



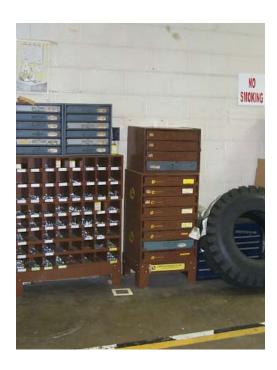
Photograph 13.



Photograph 14.



Photograph 15.



Photograph 16.



Photograph 17.

May, 2018

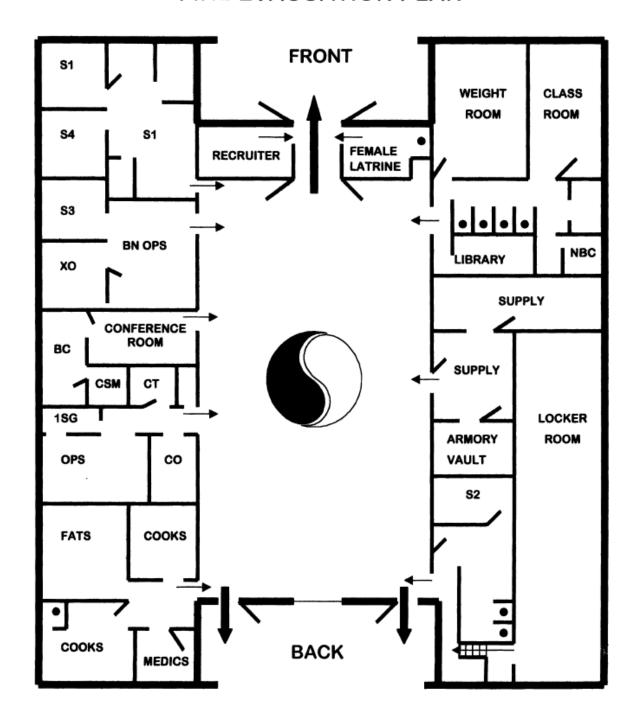
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MDARNG Facilities, Industrial Hygiene Baseline Survey, MG George M. Gelston Armory, Silver Spring, MD, Report No. 55-ML-01ED-03/07, 5 August 2003

APPENDIX C

FLOOR PLAN

MG GEORGE M. GELSTON ARMORY FIRE EVACUATION PLAN



APPENDIX D

LEAD ASSESSMENT 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 μ g/ft²) and windowsills (250 μ g/ft²) 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 $200 \,\mu\text{g/ft}^2$ 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 µg/ft² 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 in the Armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m³ 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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MDARNG Facilities, Industrial Baseline Survey, MG George M. Gelston Armory, Silver Spring, MD, Report No. 55-ML-01ED-03/07, 5 August 2003

APPENDIX E

LABORATORY REPORT



Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211 (303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

August 26, 2003

Laboratory Code: Subcontract Number: RES NA

Laboratory Report: Project Description: RES 96596-1 None Given None Given

Non-Responsive

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 96596-1 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.

Non-Responsive

President

Page 1 of 2

E-2

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 96596-1

Client: Army National Guard IH - West

Client Project Number / P.O.: None Given Client Project Description: None Given August 19, 2003 Date Samples Received:

Analysis Type: USEPA SW846 3050B / AA(7420)

Turnaround: 3-5 Day Date Samples Analyzed: August 22, 2003

Client	Lab	Sample	LEAD	Detection	LEAD
ID Number	ID Number	Area	(μg)	Limit	CONCENTRATION
		(sq.ft.)		(μg/sq.ft.)	(μg/sq.ft.)
SPBLANK01	EM 806502	0.11	BDL	23	BDL
SPW01	EM 806503	0.11	BDL	23	BDL
SPW02	EM 806504	0.11	BDL	23	BDL
SPW03	EM 806505	0.11	17.3	23	157
SPW04	EM 806506	0.11	BDL	23	BDL
SPW05	EM 806507	0.11	4.5	23	41
SPBLANK02	EM 806508	0.11	BDL	23	BDL
SPW06	EM 806509	0.11	56.3	23	512
SPW07	EM 806510	0.11	3.8	23	35
SPW08	EM 806511	0.11	BDL	23	BDL
SPW09	EM 806512	0.11	BDL	23	BDL
SPW10	EM 806513	0.11	BDL	23	BDL
SPW11	EM 806514	0.11	BDL	23	BDL
SPW12	EM 806515	0.11	BDL	23	BDL
SPW13	EM 806516	0.11	BDL	23	BDL
SPBLANK03	EM 806517	0.11	BDL	23	BDL
FRBLANK01	EM 806518	0.11	BDL	23	BDL
FRW01	EM 806519	0.11	91.7	23	834
FRW02	EM 806520	0.11	6.3	23	57
FRW03	EM 806521	0.11	BDL	23	BDL
FRW04	EM 806522	0.11	3.0	23	27
FRW05	EM 806523	0.11	BDL	23	BDL
FRBLANK02	EM 806524	0.11	BDL	23	BDL
FRW06	EM 806525	0.11	BDL	23	BDL
FRW07	EM 806526	0.11	10.7	23	97

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

Data Qa

BDL = Below Detection Limit

Page 2 of 2

E-3

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APPENDIX F

LEAD CLEANING GUIDANCE





CHAPTER 14: CLEANING

Ste	p-b	by-Step Summary	14–3
l.	Int	troduction	14–5
	A.	Performance Standard	14–5
	B.	Small Dust Particles	14–5
	C.	Difficulties in Cleaning	14–5
		1. Low Clearance Standards	14–5
		2. Worker Inexperience	14–6
		3. High Dust-Producing Methods and/or Inadequate Containment	14–6
		4. Deadlines	14–6
II.	Со	ordination of Cleaning Activities	14–6
	A.	Checklist	14–6
	B.	Equipment Needed for Cleaning	14–6
	C.	Waste Disposal	14–7
III.	Cle	eaning Methods and Procedures	14–7
	A.	Containment	14–7
	B.	Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques	14–7
		1. HEPA Vacuuming	
		2. Wet-Detergent Wash	14–9
		3. The HEPA/Wet Wash/HEPA Cycle	. 14–11
		4. Sealing Floors	
IV.	Or	der of Cleaning Procedures During Lead Hazard Control	. 14–16
	A.	Precleaning Procedures	. 14–16
	B.	Ongoing Cleaning During the Job	. 14–18
	C.	Daily Cleaning Procedures	. 14–18
		1. Large Debris	. 14–18
		2. Small Debris	. 14–18
		3. Exterior Cleaning	. 14–18
		4. Worker Protection Measures	. 14–19
		5. Maintaining Containment	. 14–19





V.		der of Final Cleaning Procedures After ad Hazard Control	1/ 10
	Α.	Final Cleaning	
		1. Decontamination of Workers, Supplies, and Equipment	14–19
	B.	Preliminary Visual Examination	14-20
	C.	Surface Painting or Sealing of Nonfloor Surfaces	14-20
	D.	Final Inspection	14-20
	E.	Recleaning After Clearance Failure	14-20
VI.	Cle	eaning Cost Considerations	14–21
	A.	Initial Clearance Test Failure Rates	14-21
	B.	Key Factors In Effective Cleaning	14-21
	C.	Special Problems	14–21
VII	. A	ternative Methods	14-22
	A.	Vacuums	14-22
	R	Trisodium Phosphata and Other Detergents	14_22



Step-by-Step Summary



Cleaning: How To Do It

- 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.
- 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.
- For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
- 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.
- 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.



-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).





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.

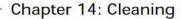
1. Low Clearance Standards

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 μg/ft² on floors.
- 500 µg/ft² on interior window sills (stools).
- 800 μg/ft² on window troughs (the area where the sash sits when closed).
- 800 μg/ft² 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.







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.

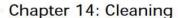
Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and triso-dium 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 finedust 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.

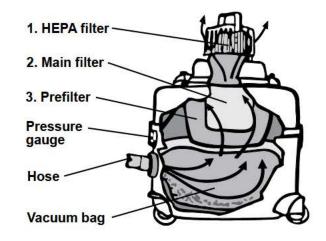
Emptying the HEPA Vacuum

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 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 highphosphate 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

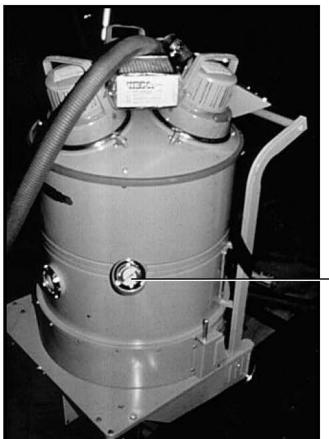


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

Pressure

gauge





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 wetwash 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. EMERGENCY EYE WASH STATION Latex Neoprene Nitrile

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:

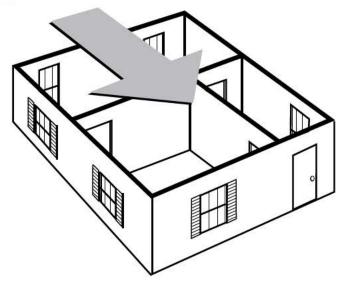
First, the area is HEPA vacuumed.



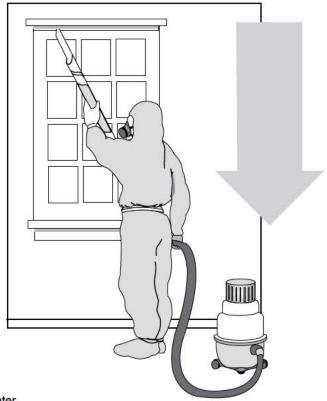


Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

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



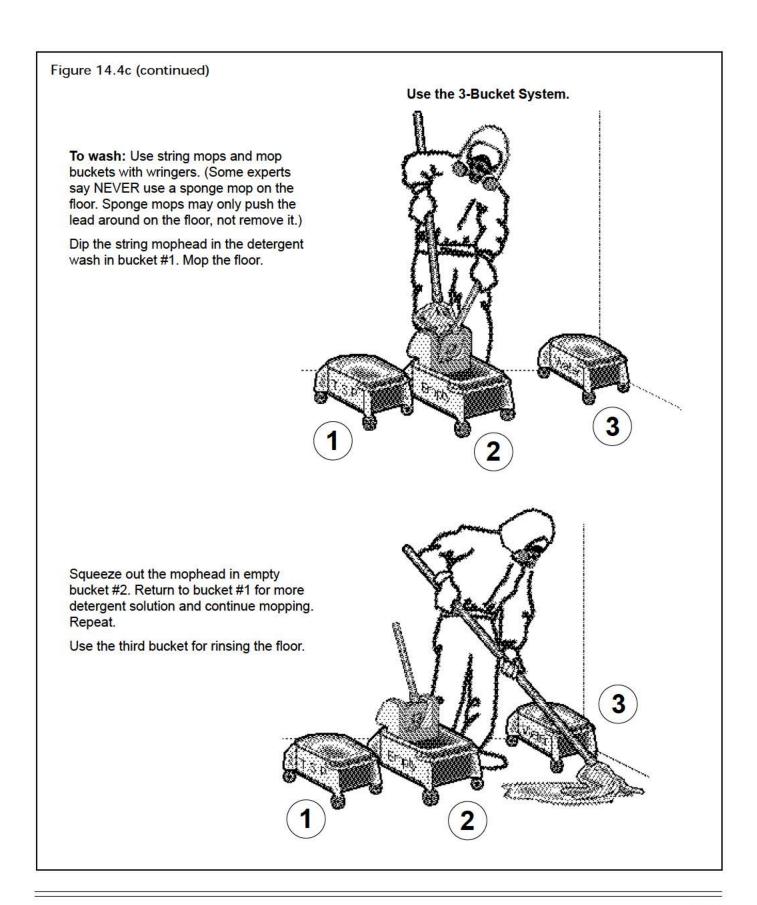


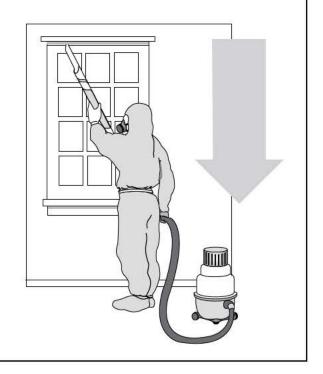




Figure 14.4d (continued)

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

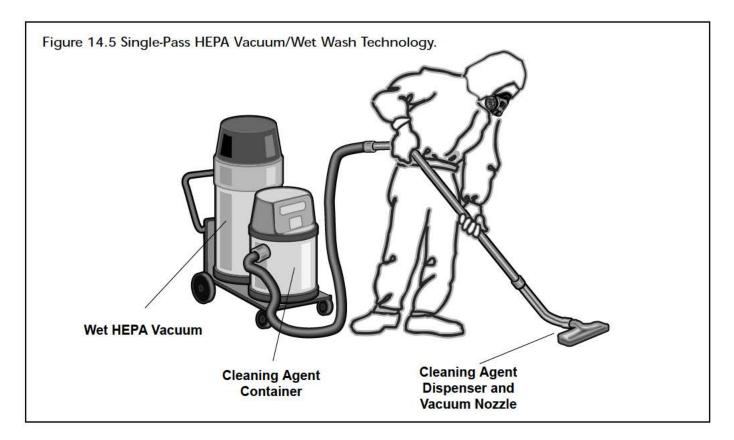
The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

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







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



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

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





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 dustretaining 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

	Mass Removal Efficiency Percentages						
Cycle Number	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 George M. Gelston Armory, Silver Spring, MD, Report No. 55-ML-01ED-03/07, 5 August 2003

APPENDIX G

MOLD CLEANING GUIDANCE

Army Facilities Management Information Document on Mold Remediation Issues

TG 277 FEBRUARY 2002



ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

INTRODUCTION	2
MOLD PREVENTION TIPS	3
REMEDIATION PLANNING	3
REMEDIATE MOISTURE AND MOLD PROBLEMS	3
REMEDIATION PROCEDURES	4
FOUR REMEDIATION LEVELS	4
HAZARD COMMUNICATION	9
CONCLUSION	10
REFERENCES	10
APPENDIX A: WATER DAMAGE CLEANUP AND MOLD PREVENTION	11
APPENDIX B: MOLD REMEDIATION GUIDELINES	14
APPENDIX C: PERSONAL PROTECTIVE GUIDANCE	17
APPENDIX D: CONTAINMENT GUIDANCE	19

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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 ft²) follow Level I guidance for PPE and containment and for a areas (>10 ft²) follow Medium (Level II) or when greater than 100 ft² 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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- 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.
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- 4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.
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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.
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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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TG 277 ### Feb 02

£ 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 (ft²)			
Books and papers	3			
Carpet and backing	1, 3			
Concrete or cinder block	1, 3	Minimum N-95 respirator, gloves, and goggles		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3			
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		None required	
Upholstered furniture & drapes	1, 3			
Wallboard (drywall and gypsum board)	3			
Wood surfaces	1, 2, 3			

MEDIUM - Tot	al Surface Area Affected Retween 10 and 1	100 ft ²	
	al Surface Area Affected Between IV and	10011	
1,3			
1,2,3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Use professional judgment, consider potential for remediator exposure and size potential for remediator/occupar	Use professional judgment, consider
1,2,3			potential for remediator/occupant exposure and size of contaminated area
1,3,4			
3,4			
1,2,3			
3			
1,3,4			
1,3	Full	Full	
1,2,3,4	Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Use professional judgment, consider potential for remediator exposure and	
1,2,3		size of contaminated area	
1,2,4			
3,4			
	3 1,3,4 1,3 1,2,3 1,2,3 1,3,4 3,4 1,2,3 RGE - Total Surfaccupant or Remedi 3 1,3,4 1,3 1,2,3,4 1,3 1,2,3,4 1,2,3 1,2,4	1,3,4 1,3 Limited or Full 1,2,3 Use professional judgment, consider potential for remediator exposure and size of contaminated area 1,3,4 3,4 1,2,3 RGE - Total Surface Area Affected Greater Than 100 ft² or Fecupant or Remediator Exposure During Remediation Estim 3 1,3,4 1,3 Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	

*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.

Wood surfaces

1,2,3,4

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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TG 277 ### Feb 02

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).

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 (ft²) 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 ft² 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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TG 277

February 2002

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278 February 2002



Table of Contents

ntroductionnt	2
Safety Tips While Investigating And Evaluating Mold And Moisture Problems	2
Communicate With Building Occupants At All Stages Of Process, As Appropriate	3
Routine Investigation And Evaluation Of Moisture And Mold Problems	3
Assessments Requiring Sampling	3
References	4
APPENDIX A: Mold Investigation Decision Logic	5
APPENDIX B: Mold Remediation Guidelines	8
APPENDIX C: Personal Protective Equipment	. 1 1
APPENDIX D: Containment Guidance	13

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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 contamination².

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

- 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 appropriate¹.

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 problems³.

- 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 contamination².

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 air⁴. 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 Control⁴."

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.

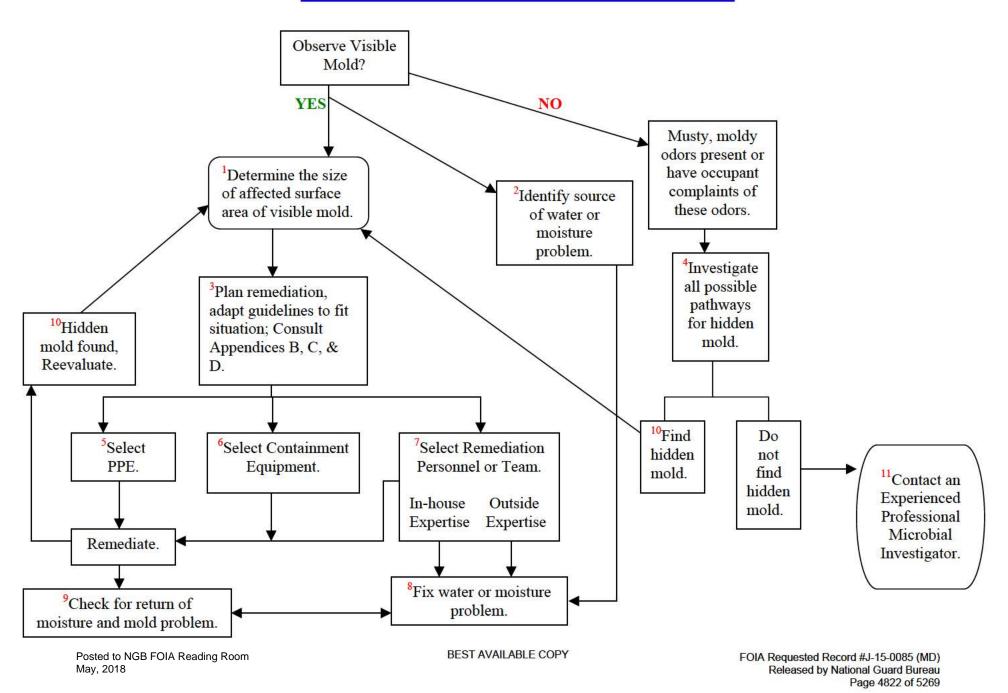
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APPENDIX A

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 activities³. 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.

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
	SMALL - Total	Surface Area Affected Less Than 10 squar	re feet (ft²)
Books and papers	3		
Carpet and backing	1, 3		None required
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3	Minimum N-95 respirator, gloves, and goggles	
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3	1	
Wood surfaces	1, 2, 3		
	MEDIUM - T	otal Surface Area Affected Between 10 and	1 100 ft ²
Books and papers	3		
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider
Non-porous, hard surfaces (plastics, metals)	1,2,3		potential for remediator/occupant exposure and size of contaminated at
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
		face Area Affected Greater Than 100 ft ² or diator Exposure During Remediation Esti	
Books and papers	3		
Carpet and backing	1,3,4		
Concrete or cinder block	1,3	Full	Full
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider potential for remediator/occupant exposure p and size of contaminated area	Use professional judgment, consider
Non-porous, hard surfaces (plastics, metals)	1,2,3		potential for remediator exposure and si of contaminated area
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	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 (ft²) 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 ft² 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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1720 Walton Road Blue Bell, PA 19422 610-828-3078 Fax 610-828-7842

February 9, 2009

E-MAIL

Ms. Non-Responsive

NGB Regional Industrial Hygienist

Army National Guard ATTN: NGB-ARS-IHNE 301-IH Old Bay Lane

Havre de Grace, MD 21078

Subject: Industrial Hygiene Assessment Report

Silver Spring Readiness Center, Silver Spring, Maryland

IES Project No. EHS08794.02

Dear Non-Responsive:

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 Silver Spring, Maryland. Thank you for the opportunity to perform this assessment. Should you have any questions, please contact Non-Responsive or me.

Sincerely,

Non-Responsive
Non-Responsive, CIH
Senior Manager, Health, Safety
& Industrial Hygiene Services

cc: Non-Responsive, ARNG
Non-Responsive, IES
Non-Responsive, IES



NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE HAVRE DE GRACE, MARYLAND

FINAL INDUSTRIAL HYGIENE ASSESSMENT SILVER SPRING READINESS CENTER 12200 CHERRY HILL ROAD, SILVER SPRING, MD 20904 SURVEY DATE: JULY 17, 2008

IES PROJECT NO. EHS08794.02 REPORT DATE: FEBRUARY 9, 2009

Certified Industrial Hygienist review by:
, CIH
Senior Manager, Health, Safety & Industrial Hygiene Services



TABLE OF CONTENTS

1.0	EXECUTIVE SUMMARY	1
	1.1 Introduction1.2 Facility Description1.3 Findings and Conclusions	1 1 2
	1.4 Recommendations	3
2.0	OPERATION DESCRIPTION	4
3.0	SAMPLE RESULTS AND MEASUREMENTS	5
	3.1 Air Sampling 3.1.1 Indoor Air Quality 3.1.2 Airborne Lead Sampling 3.2 Lead Dust Sampling 3.3 Illuminance Survey	5 5 6 7 8
4.0	ONSITE OBSERVATIONS	9
	4.1 Physical Conditions of RC4.2 Housekeeping	9 10
5.0	EQUIPMENT AND CALIBRATION DATA	10
	5.1 Sampling Equipment List5.2 Sampling Equipment Calibration Data	10 10
6.0	REFERENCES	11
	TABLES	
Table	e 1 – Air Temperature, Relative Humidity, CO ₂ and CO Measurements	5
Table	e 2 – Airborne Lead Sampling Results Summary	7
Table	e 3 - Wipe Sampling Results Summary	8
Table	e 4 – Illuminance Readings Summary	9
Table	e 5 –Sampling Equipment List	10



Table 6 - Sampling Equipment Calibration Data

11

APPENDIX

Appendix A – Readiness Center Photographs

Appendix B -Indoor Air Quality Sample Location Map

Appendix C – Air and Wipe Sampling Results

Appendix D – Lead Wipe Sample Location Map

Appendix E – Illuminance Readings Map



1.0 EXECUTIVE SUMMARY

1.1 Introduction

Assessment Date: July 17, 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 12200 Cherry Hill Road in Silver Spring, 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. Non-Responsive o, Industrial Hygienist, of IES, performed the assessment under the direction of Mr. Non-Responsive, 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: SGT. Sergio Alcantara, Supervisor, Silver Spring Readiness Center

1.2 Facility Description

Silver Spring RC, located at 12200 Cherry Hill Road, Silver Spring, Maryland is a 9,500-square foot training facility constructed of an interior of block masonry on a concrete slab with a brick exterior. Associated with the RC are an office, storage room, break room, boiler room, weight room, Drill Hall, kitchen, latrines and a former Indoor Firing Range (IFR) which was converted into a locker room. Photographs of the facility and maintenance equipment and activities are located in Appendix A of this report.

The RC is a single story training facility with a basement. The interior wall of the facility is of block construction. The office areas of the RC are heated and cooled by rooftop units, while the Drill Hall and associated areas are not. Normal working hours for the seven full time personnel (five maintenance and two administrative) are generally Tuesday through Friday from 0600 to 1730. On the day of the IH assessment, the shop was maintained by one administration personnel, four maintenance personnel and one caretaker.



1.3 Findings and Conclusions

The main findings and conclusions of the assessment are:

- On the day of the assessment there were six on-site personnel, one supervisor, four maintenance personnel and one caretaker. During a normal 10-hour day, the supervisor performs logistical work while the maintenance personnel and caretaker maintain the facility and grounds.
- Airborne lead was not detected in either of the two 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 3.3 micrograms of lead per cubic meter of air (μg/m³), which is well below the OSHA Action Level of 30 μg/m³ for lead over an 8-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 (µg/ft²). 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 average illuminance levels in several areas throughout the facility, specifically the office areas, kitchen and various storage rooms, 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.
- Building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. IES did not observe deteriorating paint or suspected asbestos-containing building materials during the IH assessment. Furthermore, IES did not observe indications of mold and bacteria growth.
- The air temperatures within the facility ranged from 75.1°F to 84.1°F, as compared to an outdoor temperature of 93.9°F. Some of the temperatures in the areas of the building outside of the offices on the northeast side exceeded what is considered comfortable, as recommended by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). Relative humidity levels througout the facility were within the 30 to 60% range as recommended by ASHRAE. IES was informed by the caretaker on the day of the survey that the roof-top air-handling unit serves only the offices located within the northeast section of the building. The rest of the building is naturally ventilated through open windows and doors.



1.4 Recommendations

IES' recommendations resulting from this assessment are included in a separate document entitled, "Silver Spring_RC_08_Recommendations."



2.0 OPERATION DESCRIPTION

INSTALLATION: RC Army National Guard

BUILDING: 12200 Cherry Hill Road, Silver Spring, Maryland

LOCATION: Site wide

OPERATION DESCRIPTION: On the day of the assessment, IES witnessed routine operations for the RC. The maintenance personnel and one caretaker were performing general maintenance on the facility and the grounds. This includes cleaning the latrines, cleaning windows and other building materials. IES was informed that these activities commence on a very regular basis. Training at the RC occurs once a month, during weekend hours.

CHEMICAL AND PHYSICAL AGENTS SAMPLED: 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.

VENTILATION SYSTEM EVALUATION: The offices of the facility are conditioned by a roof top air handling system. The rest of the building, including the Drill Hall, is naturally ventilated through open doors and windows.

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 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 both areas of 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. Building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. IES did not observe deteriorating paint or suspected asbestos-containing building materials during the IH assessment. Furthermore, IES did not observe indications of mold and bacteria growth. Temperatures collected within the areas outside of the northeast offices, exceeded ASHRAE's recommendation of a range of 68°F to 79°F, on the day of the assessment.



3.0 SAMPLE RESULTS AND MEASUREMENTS

3.1 Air Sampling

3.1.1 Indoor Air Quality

Measurements of air temperature, relative humidity, and CO₂ 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, CO₂, 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, CO₂, AND CO MEASUREMENTS

Date of Assessment: July 17, 2008

Location: National Guard RC, Silver Spring, Maryland Analyte(s): CO₂, CO, Temperature, and Relative Humidity

Exposure Guidelines: CO₂: Indoor CO₂ concentrations should be maintained at less than 700 ppm

above outdoor air levels (ASHRAE 62-2007)⁽²⁾

CO: 25 ppm (ACGIH TLV-TWA)

Temperature: 68 °F to 79 °F (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 (°F)	Measured Relative Humidity (%)
A	Conference Room - Area Sample (AS) - Approximately four feet above the ground at the center of the Conference Room.	1020 – 1024	4 Min.	520	0	75.4	51.0
В	Office Area (102) – AS – Approximately four feet above the floor at the center of the office are.	1024 - 1028	4 Min.	567	0	75.1	41.3
С	Drill Hall – AS – Approximately four feet above the floor at the center of the Drill Hall	1028 - 1032	4 Min.	445	0	84.1	42.1
D	Office 102B – AS – Approximately four feet above the floor at the center of Office 102B.	1032 - 1036	4 Min.	459	0	76.4	41.5



Sample ID	Sample Description	Start - End Time (hh:mm)	Sample Time	CO ₂ (ppm)	CO (ppm)	Measured Temperature (°F)	Measured Relative Humidity (%)
E	Outdoor – AS – Approximately four feet above the ground outside of the RC.	1036 - 1040	4 Min.	382	0	93.9	54.2
F	Caretaker's Office – AS – Approximately four feet above the floor at the center of the Caretaker's Office	1040 - 1044	4 Min.	598	0	82.3	56.2
G	Classroom – AS – Approximately four feet above the floor at the center of Classroom 108A.	1044 - 1048	4 Min.	423	0	81.4	42.2
Н	Medics – AS – Approximately four feet above the floor at the center of the Medics Office.	1048 - 1052	4 Min.	444	0	80.8	41.9
I	Locker Room – AS – Approximately four feet above the ground inside the Locker Room	1052 - 1056	4 Min.	624	0	78.3	48.4
J	Recruiter's Office – AS – Approximately four feet above the ground inside the Recruiter's Office	1056 - 1100	4 Min.	378	0	80.8	54.0

Note: - All airborne CO2 and CO concentrations are expressed in parts per million (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. 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 per cubic meters of air sample (μg/m³) 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)



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, "Silver Spring RC 08 Medical."

TABLE 2 AIRBORNE LEAD SAMPLING RESULTS SUMMARY

Date of Monitoring: July 17, 2008

Location: Army National Guard RC, Silver Spring, Maryland

Analyte(s): Lead

Occupational Exposure Limits: OSHA PEL-TWA = $50 \mu g/m^3$

OSHA Action Level (TWA) = $30 \mu g/m^3$

Sample ID	Equipment ID	Sample Description	Start Time	End Time	Sample Time (Min.)	Flow Rate (lpm)	Air Volume (I)	Measured Airborne Contaminant Concentration
071708- 001	110	Room 102 – Area Sample - Operator Breathing Zone (AS-OBH) – During normal operations within in the Readiness Center.	0640	1405	445	2.04	908	<3.3 μg/m ³
071708- 002	103	Room 104B –AS-OBH – During normal operations within in the Readiness Center.	0640	1405	445	1.92	854	<3.3 μg/m ³

Note: - Sample results for lead are expressed in micrograms of contaminant per cubic meter of air (μg/m³)

PEL-TWA = OSHA Permissible Exposure Level, 8-Hour TWA

3.2 Lead Dust Sampling

IES performed wipe sampling in the Drill Hall, converted rifle range 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 inch areas using prewetted 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 ($\mu g/ft^2$) 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, "Silver Spring_RC_08_Medical."



TABLE 3 – WIPE SAMPLE RESULTS SUMMARY

Date of Monitoring: July 17, 2008

Location: Army National Guard RC, Silver Spring, Maryland

Analyte(s): Lead

Occupational Exposure Limits: ARNG Recommended Cleaning Level = 200 µg/ft²

Sample ID	Sample ID	Location	Area of Surface Sampled	Measured Lead Surface Contamination (μg/ft²)
A	071708-SW001	Drill Hall -Wipe Sample (WS)- Surface of floor at center court	100 cm^2	<110
В	071708-SW002	Drill Hall -WS- Surface of floor near exit adjacent to the Locker Room	100 in ²	<110
C	071708-SW003	Drill Hall -WS- Horizontal surface of fire extinguisher cubby hole	100 in ²	1,500
D	071708-SW004	Kitchen -WS-Surface of counter at the window	100 in ²	<110
Е	071708-SW005	Room 102 -WS-Surface of supply diffuser in Supervisor's Office	100 in ²	<110
F	071708-SW006	Room 102 -WS-Surface of postal table in Supervisor's Office	100 in ²	<110
G	071708-SW007	Room 102 -WS-Surface of printer table in Supervisor's Office	100 in^2	<110
H	071708-SW008	Room 103C -WS-Surface of radio shelf	100 in ²	<110
I	071708-SW009	Room 103B -WS-Surface of cubicle top	100 in ²	<110
J	071708-SW010	Conference Room -WS-Surface of trophy shelf	100 in ²	450
K	071708-SW0011	Battalion Commander's Office -WS-Surface of book shelf	100 in ²	930
L	071708-SW012	Converted IFR -WS-Surface of floor at entrance to locker room	100 in ²	<110
M	071708-SW013	Converted IFR -WS-Top surface of Locker #04	100 in ²	540
N	071708-SW014	Converted IFR -WS-Surface of floor at back of locker room	100 in 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. 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 E for sample locations.



TABLE 4 ILLUMINANCE READINGS SUMMARY

Survey Dates: July 17, 2008

Location: Army National Guard RC, Silver Spring, Maryland

Sample ID	Sample Description	Average Illuminance Measurements (fc)	ARNG Recommended Illuminance Value (fc)
Α	Locker Room (former rifle range) - Center of room	49.1	7
В	Latrine – Back Side of Drill Hall	18.9	7
С	Supply – Office Area	17.4	50
D	Supply – Arms Supply	12.4	50
E	Latrine – Center of latrine	46.3	7
F	Weight Room - Center of Room	16.5	30
G	Drill Hall – Multiple Locations	15.1	10
Н	Medics Office - Center of Office	43.3	50
I	Cooks Office - Center of Office	66.5	50
J	Kitchen - Center of Kitchen	28.7	50
K	Class Room - Center of Room	27.0	30
L	107B – Center of Office	24.7	50
M	107 – Center of Office	33.1	50
N	Storage Room 105A – Center of Room	22.9	50
0	Caretaker's Office – Center of Office	17.2	50
P	Conference Room - Center of Room	18.7	30-50
Q	Batallion Commander's Office	30.4	50
R	Office 103C – Center of Office	37.7	50
S	Office 102 – Center of Office	25.0	50
T	Office 102B – Center of Office	44.3	50

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, "Silver Spring 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 indications of mold and bacteria growth. No building material 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.

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	110	110
Personal Sampling Pump	MSA Escort ELF	103	103
Primary Gas Flow Calibrator (Electronic	Bios DryCal DC-Lite	DryCal-ML	DryCal-ML
Frictionless Piston)	Model DCL-HM; S/N	-	
•	101785		
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)
110	DryCal-ML	7/17/08	2.05	7/17/08	2.03	2.04
103	DryCal-ML	7/17/08	1.93	7/17/08	1.91	1.92
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	7/17/08	Zero Gas: 0 ppm CO ₂ ; 0 ppm CO Span Gas 1,000 ppm CO ₂ ; 35 ppm CO	7/17/08	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

7.0 REFERENCES

- 1. ACGIH, 2008 TLVs and BEIs.
- 2. American Society of Heating, Refrigerating, 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. 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 – RC Assembly Hall





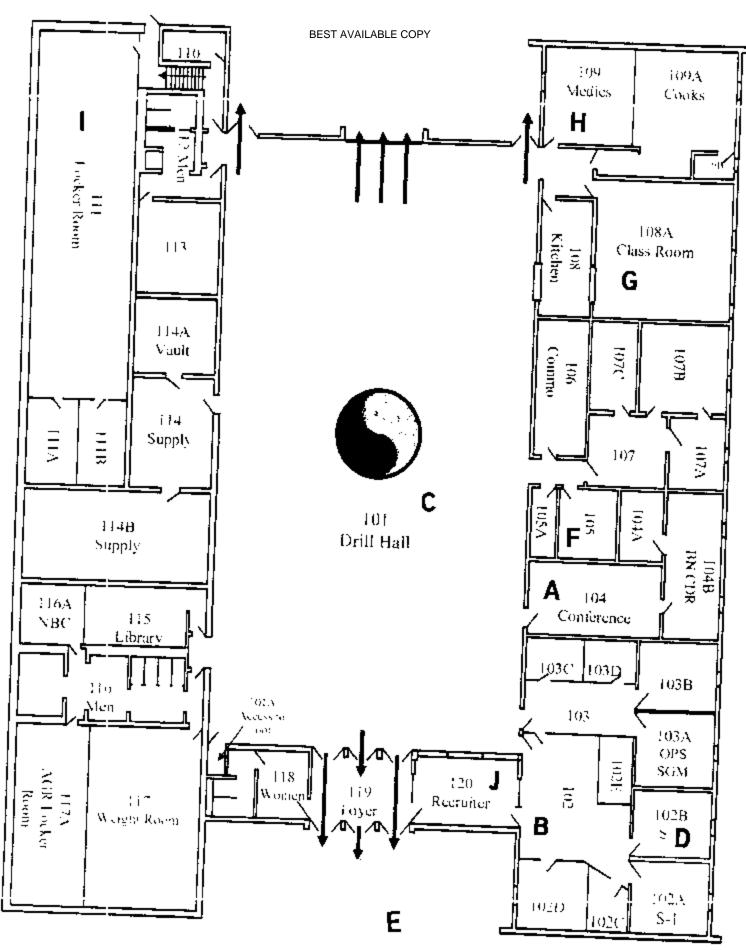
Photograph #3 – RC Kitchen



Photograph #4 – Converted Rifle Range



APPENDIX B INDOOR AIR QUALITY SAMPLE LOCATION MAP





APPENDIX C AIR AND WIPE SAMPLING RESULTS

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCREDITED ABOUTHO



Address: Client 301-IH Old Bay Lane, Attn: NGB-AVN-SI, National Guard Bureau Job Location: Job Name:

Attention: Havre de Grace, Maryland 21078 State Military Reservation S

P.O. Number:

Job Number:

,			
Report Date:	7/24/2008	Date Analyzed:	Not Provided
	on-Respon	Person Submitting:	EHS 08749.02
	7/22/2008	Date Submitted:	Silver Spring, MD
	159373	Chain Of Custody:	Not Provided

FOIA Requested Record #J 0085 (MD)
Released by National Guard Bureau
Page 4853 of 5269

Summa
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Analysis for Lead
is for
Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	rting nit	=	Final Result	-
0871106	071708-A001	Flame	Air	908	N/A	3.30	ug/m³	, ;	Ç. G	սջ/m³
0871107	071708-A002	Flame	Air	854	N/A	3.51	ug/m³	٨	3.5	uę/m³
0871108	07 1708- A003	Flame	Air Blank	0	N/A	3.00	ug/m³	٨	ţ.,	δ'n
0871109	071708-SW001	Flame	Wipe	* * *	0.108	111.52	ug/ft²	Λ	=	ug/ff²
0871110	071708-SW002	Flame	Wipe	**	0.108	111.52	ug/ft²	٨	10	ug/ft²
0871111	071708-SW003	Flame	Wipe	* * *	0.108	111.52	ug/ft²		1500	ug/ft²
0871112	071708-SW004	Flame	Wipe	* * *	0.108	111.52	ug/ft²	Λ	110	ug/ft²
0871113	071708-SW005	Flame	Wipe	* * *	0.108	111.52	ug/ft²	Α	= 0	ug/ft²
0871114	071708-SW006	Flame	Wipe	***	0.108	111.52	ug/ft^2	٨	110	ug/ft²
0871115	071708-SW007	Flame	Wipe	* * * *	0.108	111.52	սք/fi²	٨	110	ոե/Աշ
0871116	071708-SW008	Flame	Wipe	* * * *	0.108	111.52	ug/fi²	٨	110	սք/Ո՞
0871117	071708-SW009	Flame	Wipe	***	0.108	111.52	ug/fl²	٨	10	ug/ft²
0871118	071708-SW010	Flame	Wipe	* * *	0.108	111.52	ug/ft²		450	ug/ft²
0871119	071708-SW011	Flame	Wipe	* * *	0.108	111.52	ug/ft²		930	ug/π²
0871120	071708-SW012	Flame	Wipe	* * *	0.108	111.52	ug/ft²	Λ	110	ա <i>ը/</i> Ու²
0871121	071708-SW013	Flame	Wipe	***	0.108	111.52	ug/ft²		540	ug/fl²
0871122	071708-SW014	Flame	Wipe	* * *	0.108	111.52	ug/ft²		Ē	ug/ft²
0871123	0871123 071708-SW015 Flame Wipe Blank **** N/A 12.00 ug < 12 ug	Flame	Wipe Blank	***	N/A	12.00	æ	.^	12	e e
0871174	071708-SW016	Flame	Wine Blank	::	N/A	12.00	11g	Α	12	i e

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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 complete 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, anneath or and account at a particular and 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, anneath are and accountered to the accuracy and complete means and accuracy and accur

An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

AMA Analytical Services, Inc.

%Pb = percent lead by weight N/A = Not Applicable

ug = micrograms

should not be considered when interpreting the result.

Note: All results have two significant digits. Any additional digits shown Note: All samples were received in good condition unless otherwise noted

Air and Wipe results are not corrected for any blank results

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7421; Water: SM-3113B Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)

ug/L = parts per billion (ppb)

samples.

CERTIFICATE OF ANALYSIS

ACCARONTED LA

Address: Client: National Guard Bureau

Attention: State Military Reservation Havre de Grace, Maryland 21078

301-IH Old Bay Lane, Attn: NGB-AVN-SI, P.O. Number: Job Location: Job Number: Job Name:

EHS 08749.02

Not Provided

Silver Spring, MD

Not Provided

Date Submitted:

Chain Of Custody:

159373

7/22/2008

Date Analyzed:

Person Submitting:

7/24/2008

Report Date:

FOIA Requested Record #J 10920 Released by National Guard Bureau Page 4854 of 5269

Summary of Atomic Absorption Analysis for Lead

Air Volume

AMA Sample Number

Client Sample Number

Analysis Type

Sample Type

Area Wiped

Reporting

Final Result

Comments

associated with these sampes.

NY ELAP accrediation applies only to paint chip, wipe, and water See QC Summary for analytical results of quality control samples AILABLE COPY

Technical Manager

to NGB FOIA Reading Room

Analyst:

4475 Forbes Blvd. - Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (391) 459-2643

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 so 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 placeholds, 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 complete persons 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 approaches.

4. Comments:

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Posted to NGB FOIA Reading Room

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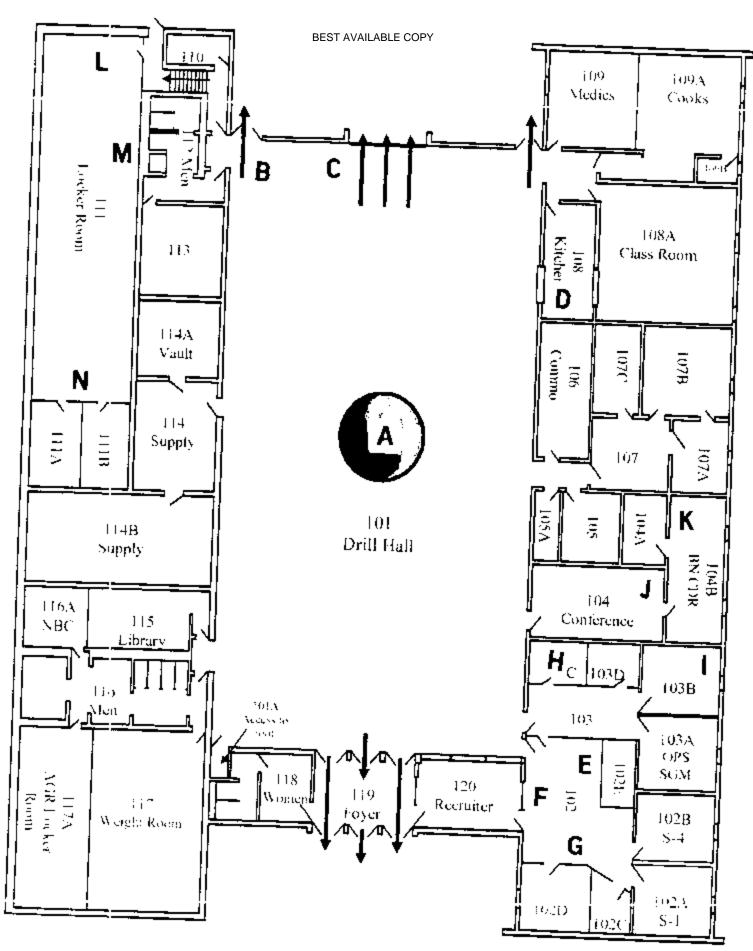
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APPENDIX D LEAD WIPE SAMPLE LOCATIONS MAP

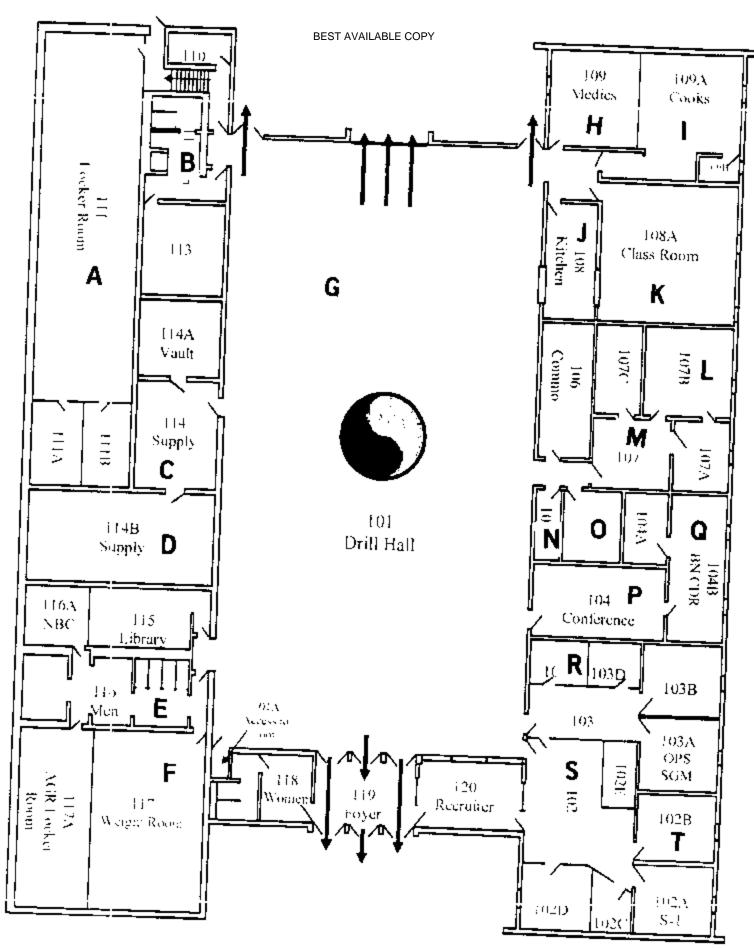


SILVER SPRING READINESS CENTER
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May, 2018



APPENDIX E ILLUMINANCE READING MAP



SILVER SPRING READINESS CENTER

Posted to NGB FOIA READINATION ASUREVEY MARRequested Record #J-15-0085 (MD)

Posted to NGB FOIA Reading Roll PSP AV LEVEY Requested Record #J-15-0085 (MD)
May, 2018

Released by National Guard Bureau
Page 4860 of 5269



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Industrial Hygiene Survey

National Guard Facility Silver Spring (White Oak) Armory 12200 Cherry Hill Road Silver Spring, MD 20904

Prepared For:

National Guard Bureau Region North IH

301-IH Old Bay Lane

Havre de Grace, MD 21078

Survey Location:

Silver Spring (White Oak) Armory

12200 Cherry Hill Road Silver Spring, MD 20904

Prepared By:

Analytical Laboratory Services, Inc.

3544 North Progress Avenue

Suite 100

Harrisburg, PA 17110

Survey Date:

October 7, 2010

Report Date:

November 1, 2010

ALSI Project #:

1010665

Non-Responsive

Director, Environmental Health & Safety

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Table of Contents 3 Section 1.0 Executive Summary 3 Section 2.0 Operation Description & Observations 4 Section 3.0 Noise Survey 5 Section 4.0 Lead Testing 6 Section 5.0 Lighting 8 Section 6.0 Indoor Air Quality 9 Section 7.0 Suspect Asbestos Containing Building Materials 11 Section 8.0 Maintenance Bay 12 Section 9.0 Limitations 13 Appendix A. Laboratory Analysis Report 14 Appendix B. Photographs 15 Appendix C. Floor Plan 16 Appendix D. References 17

Section 1.0 Executive Summary

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on October 7, 2010, at the Silver Spring (White Oak) Armory located at 12200 Cherry Hill Road, Silver Spring, MD 20904. The survey was performed by Ms Non-Responsive and Mon-Responsive

- 1. Lead surface and air samples were collected. All sample results were less than recommended guidelines or regulatory standards. Most painted areas were in good condition. Damaged paint was observed in the Drill Hall and Kitchen Supply Room. Paint should be repaired in these areas.
- 2. Lighting levels met the minimum recommended guidelines in all locations tested except for the Drill Hall. Lighting should be improved in this area.
- 3. Indoor air quality parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment. Temperature was slightly lower than the recommended guideline in the converted firing range which is now a locker/storage area. This area is unoccupied most of the time. Relative humidity, carbon dioxide (ventilation) and carbon monoxide levels were within recommended guidelines.
- 4. A few areas of water damage were observed. All sources of water infiltration should be identified and repaired. Water stained ceiling tile should be removed and replaced.
- 5. Supply and return vents were dirty. Do not permit dirt, debris, microbial growth, etc. to accumulate in any portion of the HVAC systems including the supply and return vents. Supply and return vents should be cleaned.
- 6. Exposed, black mastic was observed in the kitchen where vinyl floor tile have been removed and in the Drill Hall on the ceiling where ceiling panels were missing. This is a possible asbestos containing material (ACM) and could present a health concern if it is disturbed. If it is ACM, and there is the potential for disturbance it should be properly abated or enclosed.

Section 2.0 Operation Description & Observations

Section 2.0 Operation Description & Observations

The Silver Spring (White Oak) Armory is mainly an administrative facility with offices, training and storage areas. There were approximately seven full-time employees stationed at this facility at the time of this survey.

The building was built in 1971. It is a one story building built on a concrete slab. The exterior is masonry/stone. The interior is constructed of cement block and drywall with concrete floors. Some floors are wood or tile.

There is a central heating, ventilating, and air conditioning system (HVAC) system present. Air-conditioning was on at the time of this survey. There are two air-handling units, The air-handling units appeared to be well maintained.

There is an area of the building that was previously a firing range. It is now a locker/storage 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.

Section 3.0 Noise Survey

Section 3.0 Noise Survey

Employees were not performing tasks that provided excessive noise levels. Therefore, noise exposure monitoring was not conducted.

Section 4.0 Lead Testing

Section 4.0 Load Testing

At the time of the assessment, no activities were observed which would generate lead exposure. The Silver Spring Armory was built in 1971. Therefore, it is possible that lead-based paint hazards are present.

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 #	1.ocation	Air ug/m³	Surface ug/ft ²
1	Dill Hall	<3.2	
2	Room 102	<3.3	
3	Blank	<3 (ug)	
4	Drill Hall - Floor (Center)		<110
5	Drill Hall - Tabletop		<110
6	Drill Hall - Kitchen Countertop		<110
7	Converted Firing Range Top of Locker		<110
8	Converted Firing Range - Floor		<110
9	Converted Firing Range - AC Wall Unit Supply Grill		<110
10	Floor Outside Converted Firing Range		<110
11	Room 108A Lounge - Window Sill		<110
12	Kitchen - Top of Refrigerator		<110
13	Room 107 Supply Vent		<110
14	Room 103 - Floor		<110
15	Room 102B - Top of Bookshelf		<i10< td=""></i10<>
16	Blank		≤[2 (ug)
Criteria		50	200

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/ft² 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/ft² is a satisfactory surface

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contamination level unless the facility is utilized as a childrane facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft² on floors and 250 ug/ft² 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/m³. In fact, no detectable level of lead was identified in the air samples collected.

Most painted areas were in good condition. Damaged paint was observed in the Drill Hall and Kitchen Supply Room. Paint should be repaired in these areas.

Section 5.0 Lighting

Section 5.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 4001. 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	16.4	30-50	No
Room 108A Lounge	93.2	30-50	Yes
Kitchen	62.9	50	Yes
Room 107	104,6	30-50	Yes
Room 104	85.8	30-50	Yes
Room 103	141,3	30-50	Yes
Room 102B	145.3	30-50	Yes
Recruit Office	122.2	30-50	Yes
Room III Converted Firing Range	132.2	30	Yes

Lighting levels met the minimum recommended guidelines in all locations tested except for the Drill Hall. Lighting should be improved in this area.

Section 6.0 Indoor Air Quality

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 71.3 to 76.6 degrees F with relative humidity readings ranging from 38.3% to 46.0%. During the survey, carbon dioxide (CO₂) levels ranged from 353 ppm to 757 ppm within the facility compared to an outdoor CO₂ level of 335 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO₂ recommended is 1,035 ppm (335 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	77.1	38.3	343	0.0
Drill Hall	76.6	38.3	366	0.0
Room 108A Lounge	73.4	42.8	394	0.0
Kitchen	72.8	43.5	370	0.0
Room 107	72.7	43.8	418	0.0
Room 104	72.5	44.0	427	0.0
Room 103	74.0	45.2	498	0.0
Room 102B	73.8	45.6	547	0.0
Recruit Office	74.2	46.0	757	0.0
Room 111 Converted Firing Range	71.3	45.1	353	0.1
Outdoors	76.8	40.5	327	0.0
Criteria	73.0-79.0	30-60	<1,035	<9.0

Key: Bolded results exceed listed criteria

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Temperature was slightly lower than the recommended guideline in the converted firing range which is now a locker room area. This area is unoccupied most of the time. Relative humidity was within recommended guideline of 30-60%.

Carbon monoxide levels were less than the recommended limit of 9 PPM.

Carbon dioxide levels did not exceed the recommended ceiling of 1,035 ppm. This suggests that outdoor air ventilation is adequate in this area. There is a HVAC system in this building which provides outdoor air ventilation.

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 following items were noted:

- 1. There is a hole in the Supply Room ceiling from a previous water leak.
- 2. In Room 109 there were water stained ceiling tiles with possible fungal growth present. Efflorescence was observed on the walls.
- 3. A few water stained ceiling tile were observed throughout the building.
- 4. Supply and return vents were dirty throughout the building.

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

Section 7.0

Suspect Asbestos Containing Building Materials

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BUILDING Materials

FOIA Requested Record #J-15-0085 (MD)

May, 2018

Released by National Guard Bureau Page 4877 of 5269

Section 7.0 Suspect Asbestos Containing Building Materials

ALSI personnel performed a visual inspection for potential asbestos containing materials (ACM). No samples were collected. Inaccessible areas were not inspected.

The following are the most notable findings regarding suspect ACM at the time of this survey:

- Black mastic was observed in the kitchen where vinyl floor tile have been removed. This is a non-friable suspect material and could present a concern if it is disturbed.
- 2. Black mastic was observed in the Drill Hall on the ceiting where ceiling panels were missing. This is a non-friable suspect material and could present a concern if it is disturbed.

Section 8.0 Maintenance Bay

	Section	8.0	Maintenance	Bay
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There is no garage area at this facility.

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.

Appendix A Laboratory Analysis Report

AMA Analytical Services, Inc.



A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS



Client

National Chard Bureau

Job Name:

Silver Spring (White Oak) Amory

Chain Of Custody:

508984

NY FI AP

10920

Addresse

301-IH Old Bay Lane, Attn: NGB-AVN-SL

Job Location:

Silver Spring, MD

Date Submitted:

10/12/2010

State Military Reservation Hayre de Grace, Maryland 21078

Job Number: P.O. Number: Not Provided

Person Submitting:

K10/19/2014

Report Date:

10/22/2010

Aftention:



W912K6-09-A-0003

Date Analyzed: Revision Number:

Revised Date:

10/22/2010

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	rsis Type Sample Type Air Volume (L)				Area Wiped (ft²)	d Reporting Limit		Total ug	Final Result		Comments
1104395	1010665-1	Flame	Áir	928	N/A	3.2	ug/m³	43	<3,2	ug/in'			
1104396	1010665-2	Flame	Air	907	N/A	3.3	ug/m³	<3	<3.3	ug/m³			
1104397	1010665-3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug			
1104398	1010665-4	Flame	Wipe	****	0.108	110	ng/ft²	<12	<110	ng/ft²			
1104399	1010665-5	Flame	Wipe.	市市市市	0.108	110	ug/ft²	<12	<110	ug/ft²			
1104400	1010665-6	Flame	Wipe	***	0.108	110	ug/ft²	<12	<110	ug/ft²			
1104401	1010665-7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²			
1104402	1010665-8	Flame	Wipe	***	0.108	110	ug/fit	<12	<110	ug/fi²			
1.104403	1010665-9	Flame	Wipo	****	0.108	110	ug/ft²	<12	<110	ug/fi ²			
1104404	1010665-10	Flame	Wipo	***	0.108	110	vg/Ω^2	<12	<110	ng/fl²			
1104405	1010665-11	Flame	Wipe	***	0.108	110	ug/ft²	<12	<1.10	ug/ft²			
1104406	1010665-12	Flame	Wipe	李老孝子	0.108	110	ug/ft²	<12	<110	ug/ft²			
1104407	1010665-13	Flame	Wipe:	***	0.108	110	ug/ft²	<12	<110	ug/ft²			
1104408	1010665-14	Flame	Wipe	*+**	0.108	110	ug/ft²	<12	<110	ug/ft ²			
1104409	1010665-15	Flame	Wipe	李衣参 琴	0.108	110	ng/ft²	<12	<110	ug/ft²			
1104410	1010665-16	Flance	Wipe Blank	幸辛来安	N/A	12:	ug		<12	ug			

This region applies only to this sample, or 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 contection 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 apprepriate regulatory guidelines, unless otherwise requested by the eltent. 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, AHIA, NVLAP, NIST, or any agency of the Pederal Government. Ail rights reserved. AMA Analytical Services, Inc.

AMA Analytical Services, Inc.



A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS



Client: Address: National Guard Bureau

Job Name:

Silver Spring (White Cak) Armory

Chain Of Custody:

508984

NY ELAP

Date Submitted:

10/12/2010

10920

State Military Reservation

Hayre de Grace, Maryland 21078

301-IH Old Bay Lane, Attn: NGB-AVN-SI,

Job Number: P.O. Number:

Job Locations

Not Provided

Person Submitting:

Report Dafe: 10/22/2010

Attentions

W912K6-09-A-0003

Silver Spring: MD

Date Analyzed:

10/19/2010

Revision Number:

Revised Date:

10/22/2010

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sammle

Client Sample

Analysis Type

Sample Type

Air Volume

Area Wiped

Reporting

Total ng

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Number

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Limit

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

Analysis Method for Flame: Air. Wices. Paints, and Soll/Sollds: EPA 600/R-93/200(M)-7420; Water; SM-3111B Analysis Method For Furnace: Air, Wipes, Paints, and Scil/Solids: EPA 600/R-93/200(M)-7421; Water: SM-3113B

N/A = Not Applicable

%Pb = percent lead on a dry weight basis ug = micrograms

ma/Ka = parts per million (ppm) on a div weight basis ma/L ≈ parts per million (ppm) 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.

Analysí:



Technical Manager:



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, focations, 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 hability 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 Covernment. All rights reserved. AMA Analytical Services, Inc.

An AlfiA (#160470), NVEAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

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Focused on Results. www.masalub.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd, - Lanham, MD 20706

CHAIN OF CUSTODY

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4. Address 3: Havre de Grace: Maryland 24078 4. Contact Purs Non-Responsive Non-Responsive										
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Page 3 of 3 AMA Analytical Services, Inc.
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Appendix B Photographs

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Exterior.



Drill Hall.



Drill hall cailing, peeling paint.



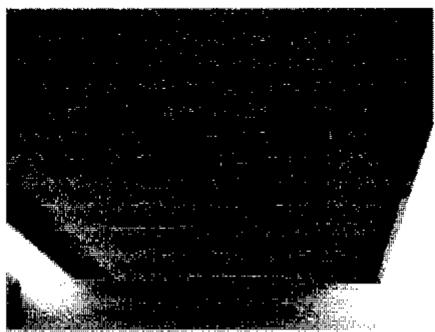
Drill hall wall, possible asbestos containing mastic.



Converted firing range.



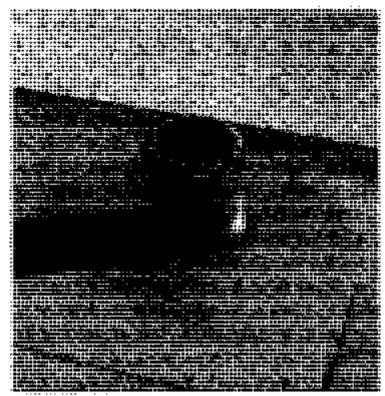
Room 109, exterior wall, visible fungal growth on ceiling tile.



Room 103, dirty supply diffuser.



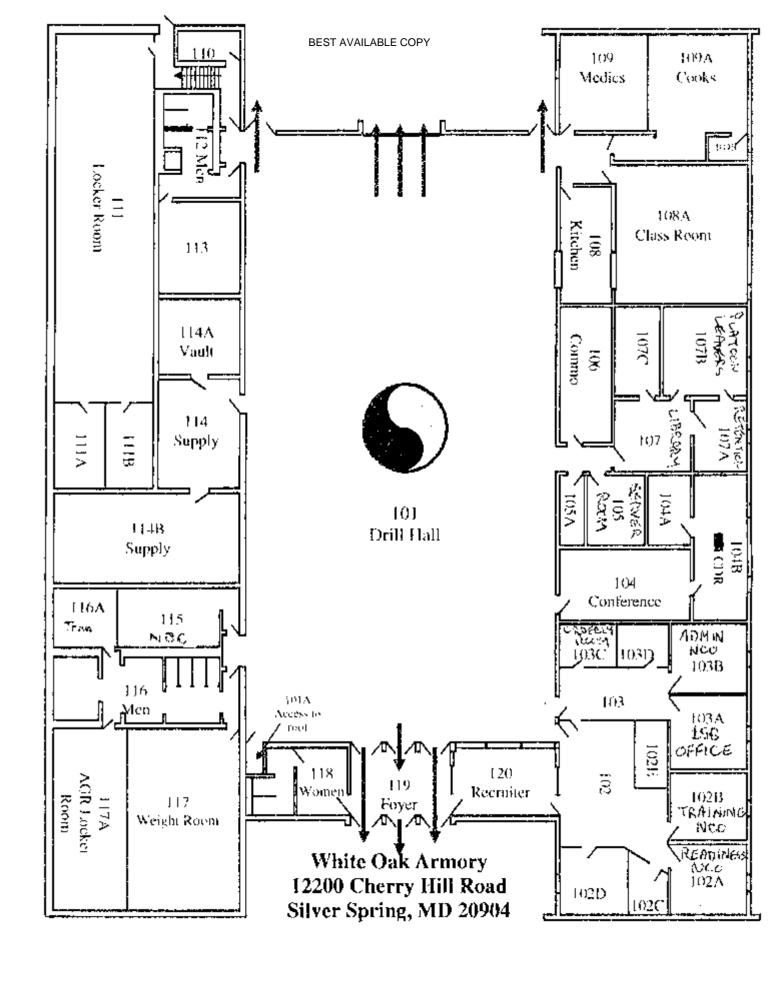
Roof, fresh air intake area.



Minest and Birght, personalitie tennet spent and that pipes.

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Appendix C Floor Plan



Appendix D References

BEST AVAILABLE COPY

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)]
- 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



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 Silver Spring Readiness Center

Prepared For: National Guard Bureau Region North IH

301-IH Old Bay Lane

Havre de Grace, MD 21078

Survey Location: Silver Spring Readiness Center

1200 Cherry Hill Road Silver Spring, MD 20940

Prepared By: Compliance Management International, Inc.

1215 Manor Drive

Suite 205

Mechanicsburg, PA 17055

Survey Date: May 8, 2013

Report Date: June 7, 2013



Manager, Industrial Hygiene Services

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Table of Contents

Section 1.0 Executive Summary	3
Section 2.0 Operation Description & Observations	4
Section 3.0 Lead Testing	5
Section 4.0 Lighting	7
Section 5.0 Indoor Air Quality	8
Section 6.0 Suspect Asbestos Containing Building Materials	10
Section 7.0 Equipment	11
Section 8.0 Limitations	12
Appendix A. Laboratory Analysis Report	13
Appendix B. Photographs	14
Appendix C. Floor Plan	15
Appendix D. References	16

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on May 8, 2013, at the Silver Spring Readiness Center located 12200 Cherry Hill Road Silver Spring, MD 20904. The survey was performed by Mr. Non-

- 1. Surface, bulk and air samples for lead were collected. Surface samples were less than the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended guideline. Air samples were less than the Occupational Safety and Health Administration (OSHA) Action Level for lead. No lead based paint was found in the bulk sample of peeling paint analyzed for lead content. See Section 3.0 for detailed findings.
- 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 were within the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guidelines of 68-79 °F in all locations.
 - b. Relative humidity levels exceeded the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in all areas evaluated.
 - c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 ppm.
 - d. Carbon dioxide (CO₂) levels were less than the ASHRAE 62.1-2010 recommended ceiling for mechanically ventilated office buildings and commercial settings.

See Section 5.0 for detailed findings.

- 4. Water-stained ceiling tiles, an active roof leak and dirty supply diffusers were observed in the facility. It was also reported the Heating Ventilating & Aircondition (HVAC) system only works in one portion of the building. See Section 5.0 for detailed findings.
- 5. Suspect asbestos containing material (ACM) was observed to be intact and in good condition. See Section 6.0 for detailed findings.

Section 2.0 Operation Description & Observations

The Silver Spring Readiness Center is mainly an administrative facility with a drill hall, offices, and a classroom. There were approximately 3 full-time employees stationed at this facility at the time of this survey.

The building was built in 1971. It is a one-story structure with concrete and aluminum exterior. The interior walls are brick, block, paneling and drywall. The floors are concrete, floor tile and carpet.

The Heating, Ventilation, and Air-Conditioning (HVAC) system consists of a gas-fired roof top unit for heat and air conditioning. The system was in operation but reportedly only heats and cools half of the building.

There is no converted firing range at this facility.

There is no child-care facility in the building.

Overall housekeeping practices were adequate.

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

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	*	< 5.7	*
2	Locker Room	*	< 5.7	*
3	Drill Hall - Floor	*	*	<110
4	Drill Hall – Top of AED Box	*	*	<110
5	Drill Hall – Top of Amnesty Box	*	*	<110
6	Kitchen – Top of Microwave	*	*	<110
7	Kitchen – Top of Ice Machine	*	*	<110
8	Hall way floor – Outside of Locker Room	*	*	<110
9	Locker Room – Floor	*	*	<110
10	Locker Room – Top of Locker	*	*	<110
11	Room 120 – Top of File Cabinet	*	*	<110
12	Office 102-B – Top of Bookshelf	*	*	<110
13	Office 103-D Ceiling Supply Diffuser	*	*	<110
14	Office 107-A – Top of Desk	*	*	<110
15	Room 108-A – Book Shelf	*	*	<110
16	Room 109-A – Storage Shelf	*	*	<110
17	Room 109-A Paint Chip	<0.0051%	*	*
18	Blank - Air	*	<3 ug	*
19	Blank - Wipe	*	*	<12 ug
-	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. $\mathbf{ug} = \text{micrograms}$

Sources:

1. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) & U.S. Department of Housing and Urban Development (HUD)

2. Occupational Safety and Health Administration (OSHA) 29CFR1910.1025 Lead Standard

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft²) 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/ft² 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/ft² on floors and 250 ug/ft² 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 below the recommended guideline of 200 ug/ft² in all sampled locations.
- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m³).
- A few areas of peeling paint were observed. A sample was collected from Room 109 (Sample #17) and determined not to be lead-based paint. However, all areas of peeling paint should be properly 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. 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	Recommended	Sufficient	
Location	(FC)	Lighting (FC)	Lighting	
Room 120	66.1	30-50	Yes	
Room 102-A	46.0	30-50	Yes	
Room 102-B	52.4	30-50	Yes	
Room 102	74.4	30-50	Yes	
Room 103-A	59.4	30-50	Yes	
Room 103-B	106.2	30-50	Yes	
Room 103	64.4	30-50	Yes	
Drill Hall	64.8	10	Yes	
Room 104	35.4	30-50	Yes	
Room 104-B	47.3	30-50	Yes	
Room 104-A	52.9	30-50	Yes	
Room 107	77.3	30-50	Yes	
Room 107-A	138.4	30-50	Yes	
Room 107-B	96.2	30-50	Yes	
Kitchen	51.0	50	Yes	
Room 108-A	54.8	30-50	Yes	
Room 109-A	105.3	30-50	Yes	
Room 109	44.8	30-50	Yes	
Locker Room	143.6	7	Yes	
Fitness Center	35.8	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 levels measured met the minimum recommended guideline in all areas tested.

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)
Fitness Center	72.5	65.6	753	0.0
Room 120	71.9	61.7	590	0.0
Room 103-B	70.3	62.2	628	0.0
Outdoors	72.1	53.1	364	0.0
Criteria	68-79	30-60	<1,064	<9

Table Notes:

- 1. **Bolded** results exceed listed criteria
- 2. **ppm** = parts per million
- 3. (%) = percent relative humidity
- 4. ${}^{\circ}\mathbf{F} = \text{degrees Fahrenheit}$

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 were within recommended guidelines in all areas tested.
- Relative humidity levels were above the recommended guidelines in all areas tested. High relative humidity can provide an environment suitable for microbial growth and proliferation. Relative humidity should be maintained at 30-60%. The HVAC system for this area should be inspected to determined if it is working properly and repaired, as needed.

- 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 at the time of the survey. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,064 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 observations were noted:
 - o There was an active roof leak in Rooms 109 and 109-A. The water infiltration is causing efflorescence and peeling paint on the exterior walls in these rooms. It is also causing the floor tiles in room 109-A to become separate from the floor.
 - o Dirty ceiling supply diffusers were observed in the facility.
 - Some water damaged ceiling tiles were observed in several locations in the facility.

Section 6.0 Suspect Asbestos Containing Building Materials

The following suspect ACM was noted at the time of this survey:

- 1. Black mastic dots on the walls and ceiling of the drill hall.
- 2. 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	98011EL	11/2012	NA
SKC Air Sampling Pump	767926	5/8/13	2.50 LPM
SKC Air Sampling Pump	647598	5/8/13	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

AMA Analytical Services, Inc.



A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC

ACCREDITED LABORATORY

INDUSTRIAL HYGENE, ENVIRONMENTAL LEAD

& ENVIRONMENTAL MICROBIOLOGY

BOOLEC 1 7005:2005

WWW.MINDUSCREGERIALDORY

LAS #100470

Client:

National Guard Bureau

Job Name:

Maryland

Chain Of Custody:

515869

Address:

301-IH Old Bay Lane, Attn: ARNG-CJG-P,

Job Location:

Silver Spring RC

W912K6-09-A-0003

Date Submitted:

5/14/2013

State Military Reservation

Havre de Grace, Maryland 21078

Job Number:

P.O. Number:

Not Provided

Person Submitting: Date Analyzed: Non-

5/21/2013

5/21/2013

Report Date:

Attention:

Von-Responsive

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)	7,000,000	oorting .imit	Total ug	Final Res	ult	Comments
13061754	1	Flame	Air	525	N/A	5.7	ug/m³	<3	<5.7	ug/m³	
13061755	2	Flame	Air	525	N/A	5.7	ug/m³	<3	<5.7	ug/m³	
13061756	3	Flame	Wipe	***	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061757	4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061758	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061759	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061760	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061761	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061762	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061763	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061764	11	Flame	Wipe	***	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061765	12	Flame	Wipe	***	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061766	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061767	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061768	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061769	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061770	17	Flame	Paint Chip	****	N/A	0.0051	%Pb		< 0.0051	%Pb	
13061771	18	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13061772	19	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. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AIHA, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS



Client:

National Guard Bureau

Job Name:

Maryland

Chain Of Custody:

515869

Address:

301-IH Old Bay Lane, Attn: ARNG-CJG-P.

Job Location:

Silver Spring RC

W912K6-09-A-0003

Date Submitted:

5/14/2013

State Military Reservation

Havre de Grace, Maryland 21078

Job Number: P.O. Number:

Not Provided

Person Submitting: Date Analyzed:

associated with these

samples.

5/21/2013

Attention:

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample

Client Sample

Analysis Type

Air Volume

Area Wiped

Reporting

Total ug

Comments

Report Date: 5/21/2013

Number

Number

Sample Type

(L)

(ft2)

Limit

Final Result

See QC Summary for analytical results of quality control samples

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

mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)

N/A = Not Applicable

%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.

supplied information nor verified by this laboratory.

Air and Wipe results are not corrected for any blank results Final results for air and wipe samples are based on client

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

Technical Manag

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. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AIHA, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

OWI (410) 247-2024

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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

4. Comments: 7945

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

Page 4913 of 5269

515809 (page 1 of 2) (301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643 **Submittal Information:** Mailing/Billing Information: 1 Job Name: 1. Client Name: National Guard Bureau RC 2. Job Location 2. Address 1: 301-IH Old Bay Lane W912K6-09-A-0003 3. Address 2: Attn: NGB-ARS-IHNE 3. Job #: _ @ phone # (410) 942-0273 4. Contact Per Address 3: Havre de Grace, Maryland 21078 5. Submitted Fax #: (410) 942-0254 5. Phone #: (410) 942-0273 Reporting Information (Results will be provided as soon as technically feasible): NORMAL BUSINESS HOURS! REPORT TO: MUM AFTER HOURS (must be pre-scheduled) th Report Immediate. 3 Day Results Required By Noon ☐ Immediate Date Due: _ Complance place. Date Due: 5 21 Ema COM Next Day (EveryAttempt Will Be 24 Hours Time Due: __ us.army.mil O Fax: Made to Accomodate) 2 Day Comments: us.army.mil Q Verb Metals Analysis) Ashestos Analysis TEM Bulk Pb Paint Chip (QTY)
Pb Dust Wipe (wipe type 100) PCM Air - Please Indicate Filter Type: ☐ ELAP 198.4/Chatfield. ☐ NIOSH 7400___ ☐ NY State PLM/TEM_ Pb Air_3 _(QTY) (QTY) ☐ Fiberglass _ Residual Ash_ Pb Soil/Solid TEM Air - Please Indicate Filter Type: □ Pb TCLP_ _(QTY) AHERA_ _(QTY) Oual. (pres/abs) Vacuum/Dust_____ (OTY) ☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY) ☐ NIOSH 7402 Ouan. (s/area) Vacuum D5755-95 _____ ☐ Waste Water ☐ Pb ____(QTY) ☐ Cu ____(QTY) ☐ As ___ Other (specify_ (QTY). Quan. (s/area)Dust D6480-99___ ☐ Pb Furnace (Media ____ ☐ EPA 600 - Visual Estimate_ (QTY) Fungal Analysis Qual. (pres/abs)_ ☐ EPA Point Count_ Collection Apparatus for Spore Traps/Air Samples:_ ☐ ELAP 198.2/EPA 100.2___ NY State Friable 198.1_ Collection Media ☐ EPA 100.1.... (OTY) Grav. Reduction ELAP 198.6. ☐ Spore-Trap____(QTY) Surface Vacuum Dust Other (specify_ All samples received in good condition unless otherwise noted. ☐ Surface Swab _____ (QTY) ☐ Culturable ID Genus (Media MISC ☐ Surface Tape (QTY) ☐ Culturable ID Species (Media. (TEM Water samples _____°C) □ Vermiculite Other (Specify____)___(QTY) Asbestos Soil PLM_(Qual) PLM_(Quan) PLM/TEM_(Qual) PLM/TEM_(Quan) CLIENT CONTACT SAMPREINFORMATION SAMPLE LOCATION VOLUME WIPE CLIENTID (LABORATORY STAFF ONLY) IDENTIFICATION AREA NUMBER Date/Time: Contact: TAT Change to romply w ROT 525 100 EM rintroct w MATLA X 1700 r Drill Holl Date/Time: By: Contact: Dall Hall MAchie × locker Room Date/Time: Contact: By: · float 10 Lasker Rock Locker 11 Rm. 120 fle Cabinet 12Rm. 102-13 - Book shelf @ Via: Veclex By (Print): Sign: 1. Date/Time RCVD: LABORATORY PostepitoNGB: FOIA Reading Room BEST AVAILABLE COPY FQIA Requested Record #J-15-0085 (MD) 3. Results Reported To: Date: Time Released by National Guard Bureau May 2018 Y

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)

515869 (page 2 of 2)

Mailing/Billing Information: 1. Client Name: National Guard Bureau		Submittal Information:	d
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	n_ n/		#: W912K6-09-A-0003
4. Address 3: Havre de Grace, Maryland 21	1079		@ub
5. Phone #: (410) 942-0273 Fa	w #: (410) 042-0254	5. (Submitted by:)	gnature t
o. Phone #: (410) 942-0213	Reporting Information (Res	ults will be provided as soon as technically fo	
AFTER HOURS (must be pre-scheduled)	NORMA	(L BUSINESS HOURS)	REPORT TO:
Immediate Date Due:	☐ Immediate ☐ 3 Day	Results Required By Noon	☑ Include COC/Field Data Sheets with Report
24 Hours Time Due:	☐ Next Day ☐ 5 Day +	(EveryAttempt Will Be	O Fax:
Comments:	☐ 2 Day Date Due:	Made to Accomodate)	□ Fax: □ Verba □ Verba □ Verba
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7 Ray 108-12 - Point Chip	- 10	XXX	Date/Time: Contact: By:
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Appendix B. Photographs



Exterior of facility



Drill hall



Drill hall ceiling peeling paint



Room 109-A Peeling paint on exterior wall



Water stained ceiling tiles in the facility

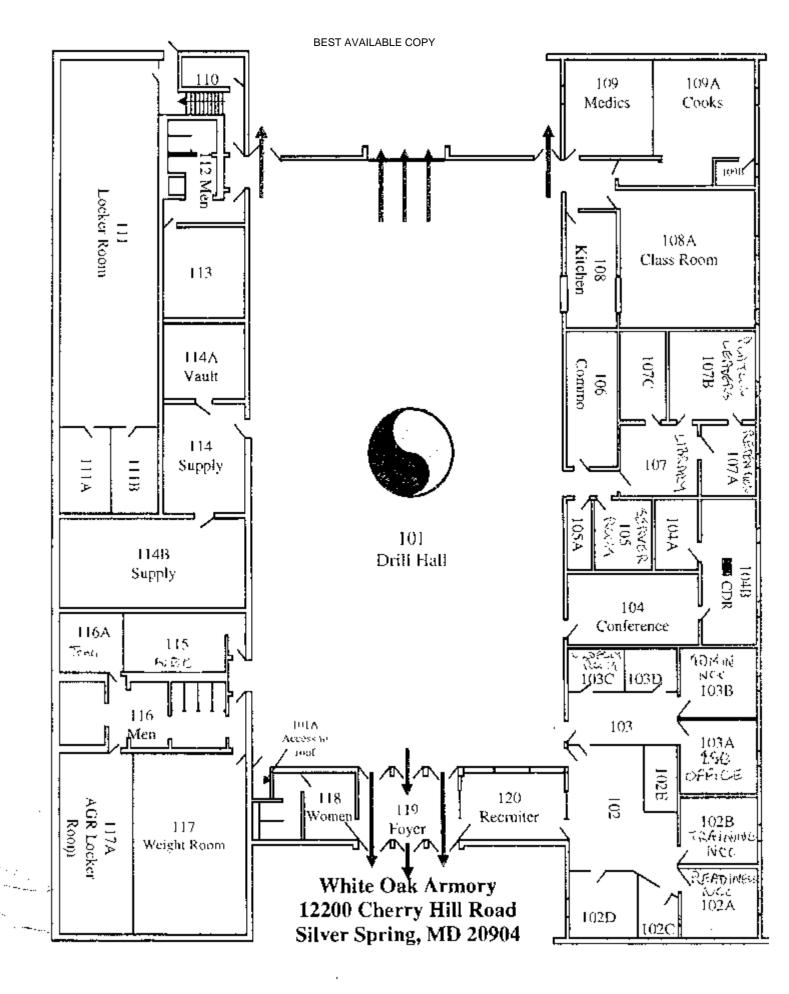


Dirty supply diffusers in the facility



Suspect asbestos black mastic dots on walls and ceiling in the drill hall

Appendix C. Floor Plan



Posted to NGB FOIA Reading Room

May, 2018

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 BLÄCKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

30 SEPTEMBER 2005

MEMORANDUM FOR Region North Industrial Hygiene Office (NGB-AVS-SI-IH/Ms. Non-Responsive National Guard Bureau, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Towson (Old) Armory, Towson, 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. Non-Responsive, at commercial 410-436-5475/3118, DSN 584-5475/3118, or electronic mail: Non-Responsive @us.army.mil

FOR THE COMMANDER:

Encl

Non-Responsive

Director, Occupational Health Science

Readiness thru Health



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





MDARNG FACILITIES IH BASELINE SURVEY
TOWSON (OLD) ARMORY
TOWSON, MD
55-ML-01ED-03/05
10 JULY 2003











Approved for public release; distribution unlimited

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.



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
TOWSON (OLD) ARMORY
TOWSON, MD
PROJECT NO. 55-ML-01ED-03/05
16 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. 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.

CONCLUSIONS.

- a. <u>Lead in Air</u>. All air samples were below the Occupational Safety and Health Administration (OSHA) standard for lead in air. There was no overexposure to personnel from lead in air in this building.
- b. <u>Lead in Dust</u>. 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.
- e. <u>Lead in Paint</u>. Deteriorated lead-based paint (LBP) was found throughout the facility. Falling paint is likely to contribute to the levels of lead in dust, and will continue to deteriorate unless it is stabilized. Deteriorated LBP can be potentially hazardous to children if contacted.
- d. <u>Asbestos.</u> Some pipe insulation in the classroom that is presumed to be asbestos-containing material (ACM) was exposed. If it is determined to be asbestos it must be encapsulated or removed as soon as possible. There were also presumed asbestos vinyl floor tiles in the armory. The tiles are intact; however, if they are damaged in the future, the tiles may become friable and asbestos fibers may be released. There was no Asbestos Management Plan (AMP) for the facility.

Readiness thru Health



- e. <u>Safety</u>. Equipment in the Supply Storage Room posed a potential tripping hazard, and a potential for injury from falling materials.
- 3. RECOMMENDATIONS. The Department of Defense Instruction (DODI) 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 DODI 6055.1 also provides RACs for Safety and Ergonomic Hazards. 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 adults. Health RAC 2 for children.
- (1) Develop and implement a written Lead Hazard Management Plan for Towson Armory. Ensure that the armory is in compliance with the OSHA Lead Standard, Title 29 Code of Federal Regulations (CFR), Parts1910.1025, and the OSHA Lead in Construction Standard, Title 29 CFR Part 1926.62.
 - (2) Repair and stabilize deteriorated paint.
- (3) Discontinue advertising and hosting events that include children in the armory until cleanup is completed. Clean horizontal surfaces in the Drill Hall to the Environmental Protection Agency, and State of Maryland lead in dust standard for children. Clean horizontal surfaces in the administrative areas to the National Guard Bureau (NGB) Region North and U.S. Army Center for Health Promotion and Preventive Medicine decontamination levels.
- (4) Clean all areas where sampling results showed clevated 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 indoor firing range (IFR) provided in the Addendum to NGB All States Letter P01-0075. Consult with the Maryland Armory Environmental Coordinator concerning disposal requirements after cleanup.
- (5) Pending cleanup, 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. Asbestos Exposure. Health RAC 3 if asbestos is present.

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EXSUM, MDARNG Facilities IH Baseline Surveys, Towson (Old) Armory, Towson, MD, Project No. 55-ML-01ED-03/05

- (1) Review armory and the Maryland NGB office records to determine whether there are asbestos records for inspection and abatement, or if there is an AMP for Towson Armory.
- (2) If records cannot be located, sample the exposed pipe insulation and vinyl floor tiles to determine whether they are ACM.
- (3) If they are determined to be asbestos and become damaged, encapsulate or remove them as soon as possible.
- (4) If asbestos is identified, develop and implement an AMP if there is not one for the armory. Army policy requires an AMP for all asbestos in the facility, and to take immediate corrective action where a possible asbestos hazard has been identified.
- c. <u>Safety Hazards</u>. RAC 4. Reorganize the equipment in the Supply Storage Room. There was a danger of people tripping on the equipment and supplies, and the potential for items to fall onto people entering the room.

TABLE OF CONTENTS

Para	agraph	Page
1.	REFERENCES	1
2.	PURPOSE OF EVALUATION	
	AUTHORITY	
	BACKGROUND INFORMATION	
6.	PHOTOGRAPHSFACILITY EVALUATION	2
	ASSESSMENT CRITERIA FOR LEAD	
	SAMPLING RESULTS, DISCUSSION AND CONCLUSIONS	
	RECOMMENDATIONS	
10.	ADDITIONAL ASSISTANCE	6
Арр	pendices	
Α. :	REFERENCES	A-1
B . 3	REFERENCES PHOTOGRAPHS	B-1
C	SAMPLING LOCATIONS AND RESULTS	C-1
	ASSESSMENT CRITERIA FOR LEAD	
E. 3	LEAD CLEANING GUIDANCE	E-1
Tab	le	
	BLE LEAD IN SURFACE DUST WIPE LOCATIONS AND ANALYTICAL RESULTS	4



DEPARTMENT OF THE ARMY

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

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MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS TOWSON (OLD) ARMORY TOWSON, MD PROJECT NO. 55-ML-01ED-03/05 10 July 2003

- REFERENCES. See Appendix A.
- 2. 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. 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. Electronic mail: MDARNG, Ms. Non-Responsive, 28 February 2003, subject: SAB.
- 4. BACKGROUND INFORMATION.
- a. <u>Armory Mission</u>. Towson (Old) Armory is the home of the 290 th Military Police Company Guard.
 - b. Date of Construction. The approximate date of construction was 1932.
- c. <u>Armory Use by Children</u>: The point of contact stated that the armory was occupied by children throughout the year. Events included after school basketball practice, sponsored activities for children on drill weekends, and additional activities for children approximately three times per year. The Maryland Military Department is currently advertising Towson Armory as available for rental for activities that may include young children.
- d. <u>Points of Contact.</u> Manager: SFC Non-Responsive, Towson (Old) Armory, 307 Washington Avenue, Towson, MD 21204-4765

Readiness thru Health



- 5. PHOTOGRAPHS. See Appendix B.
- 6. FACILITY EVALUATION.
- a. <u>Sampling Locations and Results</u>. Samples were collected for lead in air, on surfaces (wipe samples) and in bulk paint to determine the presence of lead hazards. Sample results are shown in the Table and in Appendix C.
 - b. Physical Condition of facilities.
- (1) General. The facility appeared to be in good condition. No mold or moisture source capable of supporting mold was observed.
- (2) Paint. There was deteriorated paint throughout the armory. The age of the building indicated that the presence of lead-based paint (LBP) was likely. The radiators had areas of deteriorated paint at the time of the survey, but it was reported that they were repainted in 2001 with non-LBP. SSG Non-Responsive, Environmental Compliance Assessment Coordinator for the MDNGB stated that there were no records of any lead abatement for this facility.
- (3) Asbestos. We informed SSG that there was exposed presumed asbestos-containing material (ACM) in some pipes in the classroom. SSG Non-Responsive stated that the National Guard Bureau (NGB) had abated some asbestos in the armory, and further abatement was planned. There were also intact presumed asbestos tiles throughout the armory. A site Asbestos Management Plan (AMP) was not located in the armory.
- c. <u>Safety Hazards</u>. Equipment in the Supply Storage Room was disorganized (Photograph number 0833, Appendix B) and posed a potential tripping hazard, and a potential for injury from falling items.
- d. <u>Indoor Firing Range</u>. The indoor firing range (IFR) had been converted to the Supply Storage Room. There were no records found of cleaning or lead abatement in the IFR.
- e. <u>Safety and Occupational Health Programs</u>. There was no written Lead Hazard Management Plan (LHMP) or AMP in the facility. There was no written Hazard Communication (HAZCOM) Program. The Occupational Safety and Health Administration (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.

- f. <u>Heating, Ventilation, and Air-Conditioning Systems</u>. The building was centrally heated by steam baseboard radiators. Some areas of the building had window air-conditioning units. There were no reported or observed problems with the ventilation.
- g. <u>Noise Dosimetry</u>. No operations with the potential to generate hazardous noise levels were identified.
 - h. Lighting. All areas of the armory were visually judged to be adequately lit.
- ASSESSMENT CRITERIA FOR LEAD. See Appendix D for details.
- a. <u>Lead in Air.</u> The Army complies with the OSHA 8-hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter (µg/m³) 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 $(\mu g/fl^2)$ on floors, 250 $\mu g/fl^2$ on window sills, and 400 $\mu g/fl^2$ 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 $\mu g/fl^2$ on floors and frequently contacted surfaces, which is more stringent for window sills than the EPA/State standards.
- c. <u>Lead in Paint</u>. 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 LBP according to BPA 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.
- d. <u>Lead Carcinogenicity</u>. In February 2005, the Department of Health and Human Services National Toxicology Program (NTP) released the Report on Carcinogens, Eleventh Edition. The NTP report lists "lead and lead compounds" as "reasonably anticipated to be human carcinogens".
- 8. SAMPLING RESULTS, DISCUSSION, AND CONCLUSIONS.
 - a. Lead.

- (1) Lead in Air. General area lead in air sampling was conducted throughout the armory. All air samples were below the OSHA standard for lead in air. There was no overexposure to personnel from lead in air in this building.
- (2) Lead in Dust. Lead in dust wipe sample locations and analytical results are shown in the Table below. Levels of lead in dust that exceeded safe limits for children and adults were found in two rooms in the armory. These levels may result in health hazards to employees and to children visiting the armory. Extremely high levels of lead were found on the floor of the former IFR (2693 $\mu g/\Re^2$). Personnel working in the former IFR are potentially exposed to lead in dust, and are tracking lead out of the area and redistributing it into adjacent rooms in the armory. This can result in lead exposures for children and for the general workforce.

TABLE, Lead in Surface Dust Wipe Locations and Analytical Results.

Wipe Sample #	Locations of Samples	Conc. (μg/ft²)	
TOW01	Assembly Hall Floor Entrance		
TOW02	Assembly Hall Floor by Fire Extinguisher	<23	
TOW03	Assembly Hall Floor Center .	<23	
TOW04	Kitchen Counter	<23	
TOW05	Room 209 Floor		
TOW06	Room 209 Window Sill	03 93	
TOW07	Former Firing Range/ Supply Room	146 - 6 - 34	
TOW08	Classroom Floor		
TOW09	Classroom Window Sill		
TOW10	Air Conditioner Filter	<23	

- (3) Lead in Paint. Deteriorated LBP was found throughout the facility. Falling paint is likely to contribute to the levels of lead in dust, and will continue to deteriorate unless it is stabilized. Deteriorated LBP can be potentially hazardous to children if contacted.
- b. <u>Asbestos Exposure</u>. Some pipe insulation in the classroom that was presumed to be ACM was exposed. If exposed insulation is determined to be asbestos it must be encapsulated or removed as soon as possible. There were also presumed asbestos vinyl floor tiles in the armory. The tiles are intact; however, if they are asbestos and they are damaged in the future, they may become friable and asbestos fibers may be released.

RECOMMENDATIONS. The Department of Defense Instruction (DODI) 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 DODI 6055.1 also provides RACs for Safety and Ergonomic Hazards. 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 adults. Health RAC 2 for children.
- (1) Develop and implement a written LHMP for Towson Armory. Ensure that the armory is in compliance with the OSHA Lead Standard, Title 29 Code of Federal Regulations (CFR), Parts 1910.1025, and the OSHA Lead in Construction Standard, Title 29 CFR Part 1926.62.
 - (2) Repair and stabilize deteriorated paint.
- (3) Discontinue advertising and hosting events that include children in the armory until cleanup is completed. Clean horizontal surfaces in the Drill Hall to the EPA and State of Maryland lead in dust standard for children. Clean horizontal surfaces in the administrative areas to the NGB Region North and USACHPPM decontamination levels.
- (4) Clean all areas where sampling results showed clevated 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 provided in the Addendum to NGB All States Letter P01-0075. Consult with the Maryland Armory Environmental Coordinator concerning disposal requirements after cleanup.
- (5) Pending cleanup, 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, disposable coveralls, and booties to prevent tracking lead to other areas of the armory when working in the former IFR.
 - b. Asbestos Exposure. Health RAC 3 if asbestos is present.
- (1) Review armory and the MDNGB office records to determine whether there are asbestos records for inspection and abatement, or if there is an AMP for Towson Armory.

- (2) If records cannot be located, sample the exposed pipe insulation and vinyl floor tiles to determine whether they are ACM.
- (3) If they are determined to be asbestos and become damaged, encapsulate or remove them as soon as possible.
- (4) If asbestos is identified, develop and implement an AMP if there is not one for the armory. Army policy requires an AMP for all asbestos in the facility, and to take immediate corrective action where a possible asbestos hazard has been identified.
- c. <u>Safety Hazards</u>. RAC 4. Reorganize the equipment in the Supply Storage Room. There was a danger of people tripping on the equipment and supplies, and the potential for items to fall onto people entering the room.
- d. <u>Safety and Occupational Health Programs/Hazardous Materials Management</u>. Health RAC 3. Develop and implement a written HAZCOM Program for the facility. Maintain records for HAZCOM training and store them in an accessible area.
- 10. 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: Non-Responsive @us.army.mil

Non-Responsive

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

APPROVED:



Technical Program Manager Industrial Hygiene Field Services Program

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MDARNG Facilities IH Baseline Surveys Towson (Old) Armory, Towson, MD Project No. 55-ML-01ED-03/05

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

- 1. Occupational Safety and Health Administration (OSHA) Title 29, Code of Federal Regulations (CFR), Part 1910.107 and 1910.94. 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.mit/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.md/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. AR 420-70, Buildings and Structures, 10 October, 1997. http://usachppm.apgea.army.mil/ihfs/LeadList.aspx
- 7. American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc. (ASHRAE) 62-2002, Ventilation for Acceptable Indoor Air Quality, ASHRAE, Atlanta, GA.
- 8. Illuminating Engineering Society of North America, ANSI/IESNA RP-1-1993, American National Standard Practice for Office Lighting, ANSI/IES RP-1-1993.
- 9. U.S. Environmental Protection Agency, Lead in Paint, Dust, and Soil. 1 February 2003. http://www.epa.gov/lead/
- 10. Maryland State Department of the Environment, Lead Poisoning Prevention Program/ Lead Enforcement Division, COMAR 26.02.07.12 Procedures for Determining Compliance, http://www.dsd.state.md.us/comar/26/26.02.07.12.htm
- 11. USACHPPM Interim Report No. 39-EJ-1157-99, Derivation of Wipe Surface Screening Levels for Environmental Chemicals, 1999.

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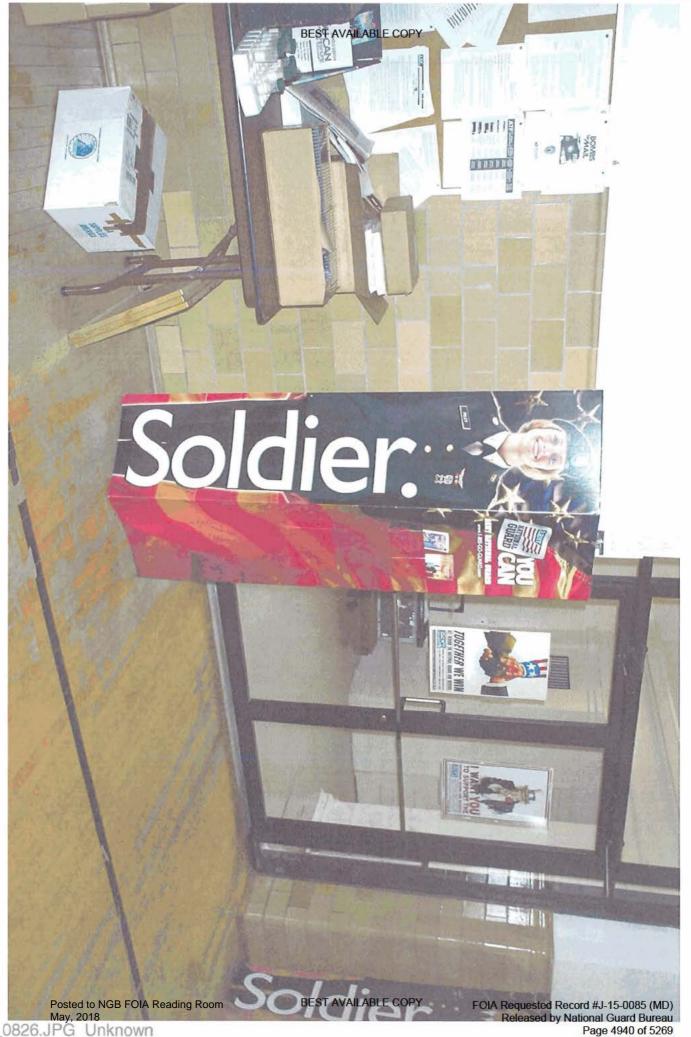
MDARNG Facilities IH Baseline Surveys Towson (Old) Armory, Towson, MD Project No. 55-ML-01ED-03/05

APPENDIX B

PHOTOGRAPHS

Towson (Old) Armory MD Photographs

Photo Number	Location
826	Assembly Hall / Lead in air and surface wipe sampling on floor
827	Assembly Hall / Lead in air and surface wipe sampling on floor
828	Assembly Hall / Lead in air and surface wipe sampling on floor
829	Kitchen Counter/ Lead surface wipe sampling
830	Room 209 Floor/ Lead surface wipe sampling
. 831	Room 209 Window Sill/ Lead surface wipe sampling
832	Room 209/ Deteriorated paint sampling
833	Supply Room (Former IFR) / Lead surface wipe sampling
834	Classroom Floor/ Presumed asbestos-containing pipe insulation
836	Classroom Window Sill/ Lead in surface wipe sampling



DCP_0826.JPG Unknown





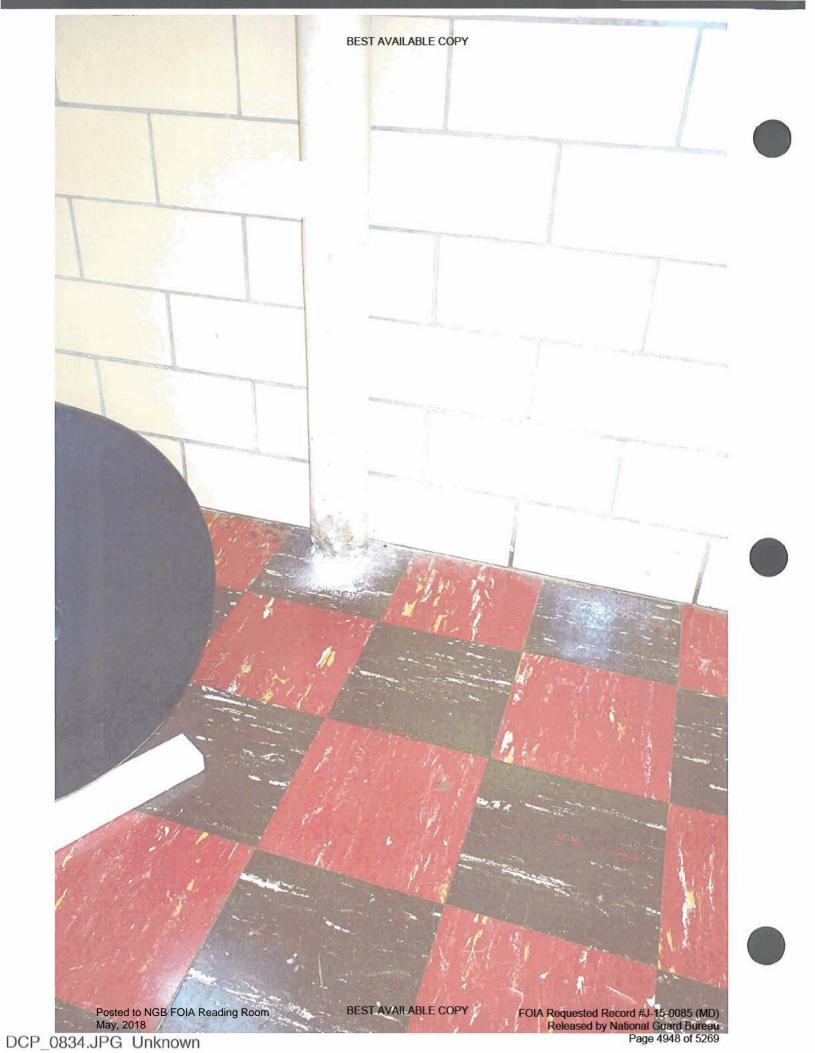


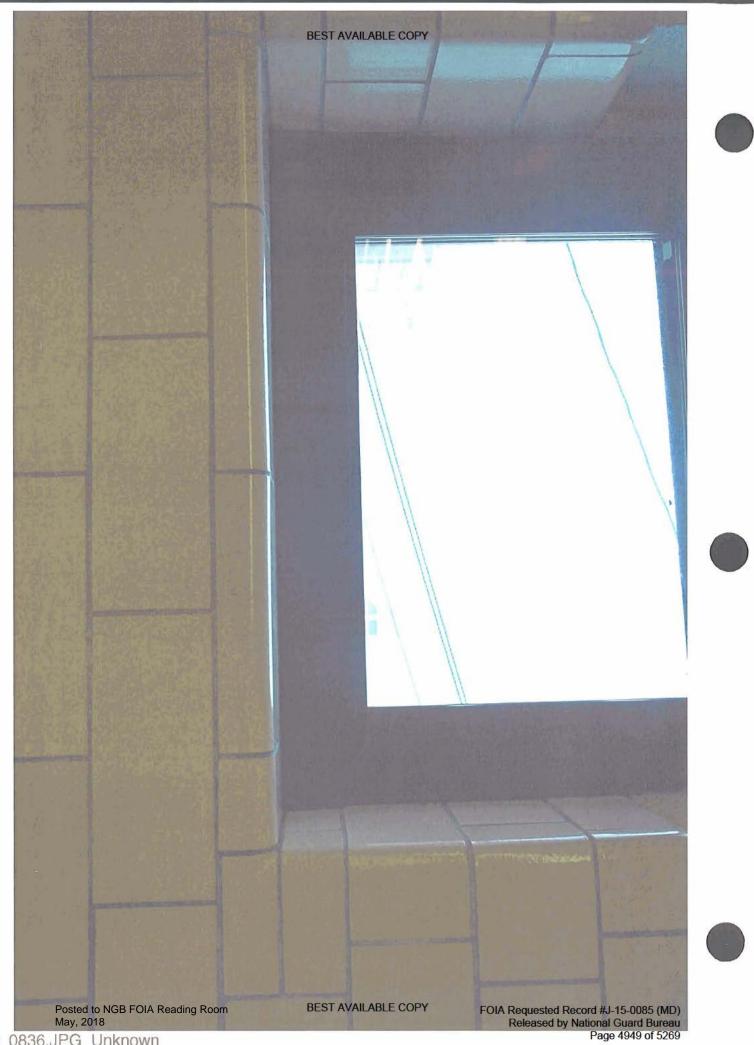












DCP_0836.JPG Unknown

MDARNG Facilities IH Baseline Surveys Towson (Old) Armory, Towson, MD Project No. 55-ML-01ED-03/05

APPENDIX C SAMPLING LOCATIONS AND RESULTS



TEST REPORT Page 1 of 2 7/23/03

Submitted To:

NGB, Army National Guard

Region IH North; ATTN: NGB-AVS-S1; 301 Old Bay Ln. Havre de Grace, MD 21078-4094

Reference Data:

Client Sample No.:

P.O. No.:

Sample Location:

Sample Type:

Method Reference: DCL Set ID No.:

DCL Sample ID No.:

Sample Receipt Date:

Preparation Date:

Analysis Date:

Lead

TOAir1 through TOBlank2

VISA

Towson (Old) Armory

Filter

NIOSH 7300

03-5-3475

03-21664 through 03-21667

7/18/2003

7/21/2003

The samples were prepared and analyzed in accordance with NIOSH method 7300 using a Thermo Jarrell Ash 61E (ICP) purged spectrometer.

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.



CINCINNATI OFFICE 4388 GLENDALE-MILFORD ROAD CINCINNATI, OHIO 45242-3706 513 733-5338, FAX 513 733-5347



WEST COAST OFFICE 11 SANTA YORMA COURT NOVATO, CALIFORNIA 94945 800 280-8071, FAX 415 899-9469

TEST REPORT Page 2 of 2 03-8-3475

Results Lead

Client #	DCL #	Sample Volume (L)		
TOAirl	03-21664	366.	ND	<0.0055
TOALT2	03-21665	368.	ND	<0.0054
TOBlank1	03-21666		ND	
TOBlank2	03-21667	<u>-</u>	ND	_
			,	100
10.	Prep Blank		ND	
% Recovery	LCS	-	104.	
		1. 41		
RPL			2.0	/

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





RESERVOIRS ENVIRONMENTAL, INC.

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

TABLE I. ANALYSIS: LEAD BY WIPE SAMPLING

RES Job Number;

RES 95429-1

Client:

. USACHPPM

Client Project Number / P.O.;

None Given

Client Project Description:

None Given

Date Samples Received:

July 15, 2003

Ańalysis Type:

USEPA SW846 3050B / AA(7420)

Tumaround:

3-5 Day

Date Samples Analyzed:

July 17, 2003

Client	Lab	Sample	LEAD	Detection	LEAD
1D Number	ID Number	Area (sq.ft.)	(µg)	Limit (µg/sq.ft.)	CONCENTRATION (µg/sq.ft.)
TOW Blank 1	EM 794895	0.11	BDL	23	BDL
TOW 1	EM 794896	0.11	BDL	23	BDL
TOW 2	EM 794897	0.11	BDL	23	BDL
TOW 3	EM 794898	0.11	BDL	23	BDL
TOW 4	EM 794899	0.11.	BDL	23	BDL
TOW 5	EM 794900	0.11	4.5	23	41
TOW Blank 2	EM 794901	0.11	BDL	23	BDL
TOW 6	EM 794902	0.11	BDL	23	BDL
TOW 7	EM 794903	0.11	294.0	23	2673
TOW 8	EM 794904	0.11	BDL	23	BDL
TOW9	·EM 79490S	0.11	BDL	23	BDL
TOW 10	EM 794906	0.11	BDL	23	BDL
TOW Blank 3	EM 794907	0.11	BDL	23	BDL

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

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RESERVOIRS ENVIRONMENTAL, INC.

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

TABLE I. ANALYSIS: LEAD IN PAINT

RES Job Number:

HES 95429-2

Cijent:

USACHPPM

Client Project Number / P.O.:

None Given

Client Project Description:

None Given

Date Samples Received:

July 15, 2003

Analysis Type:

USEPA SW846 3050B / AA (7420)

Turnaround:

3-5 Day

Date Samples Analyzed:

July 22, 2003

Client	Lab	Detection	LEAD
ID Number	10 Number	Limit .	CONCENTRATION
	<u> </u>	(%)	(%)
TOBU 1	EM 794908	0.005	1.972

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MDARNG Facilities IH Baseline Surveys Towson (Old) Armory, Towson, MD Project No. 55-ML-01ED-03/05

APPENDIX D

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE
ASSESSMENTS CRITERIA FOR LEAD

MDARNG Facilities IH Baseline Surveys Towson (Old) Armory, Towson, MD Project No. 55-ML-01ED-03/05

APPENDIX D

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGUENE OFFICE ASSESSMENTS CRITERIA FOR LEAD

May, 2018

Subject: National Guard Bureau (NGB) Region North Industrial Hygiene Office Recommendations for Surface Lead Dust in Armeries

- 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 (μg/ft²). 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 µg/fl²) and windowsills (250 µg/fl²) 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 cites a level of 200 $\mu g/ft^2$ in 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, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that $200~\mu g/\Omega^2$ 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 μ g/ R^2 on floors and 250 μ g/ R^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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MDARNG Facilities 1H Baseline Surveys Towson (Old) Armory, Towson, MD Project No. 55-ML-01ED-03/05

APPENDIX E

... LEAD CLEANING GUIDANCE

HUD TECHNICAL GUIDELINES FOR THE EVALUATION AND CONTROL OF LEAD-BASED PAINT HAZARDS IN HOUSING 1998





Chapter 14: Cleaning

1. 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 dally 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 loaded 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 yg/ft² on floors.
- 500 µg/ft² on interior window sills (stools).
- 800 µg/ft² on window troughs (the area where the sash sits when closed).
- 800 µg/ft² on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupled 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.





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.

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 cartified 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 procleaning (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-mit plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mit polyathylene plastic sheeting (or equivalent).

Chapter 14: Cleaning



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 solected 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, ospecially 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, suggerus that other tools and products may also be effective in afficiently 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, crovice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small funchbucket-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, perticularly 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.

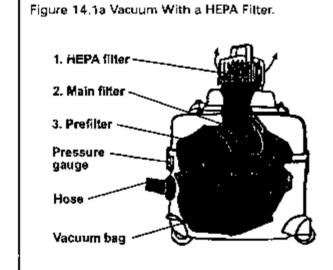
To aid in distodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator heed) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture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





Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and prefilter. Debris gets sucked in through the hase 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 agein.

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 detargents have been used to remove leaded dust. Those with a highphosphate 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

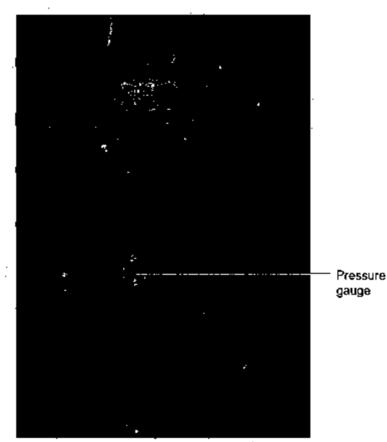
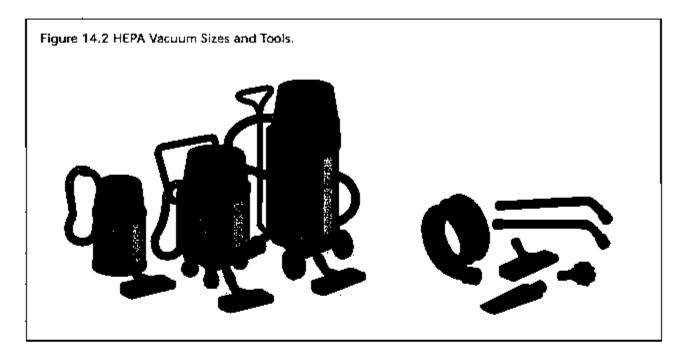


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.





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 wotwash process.

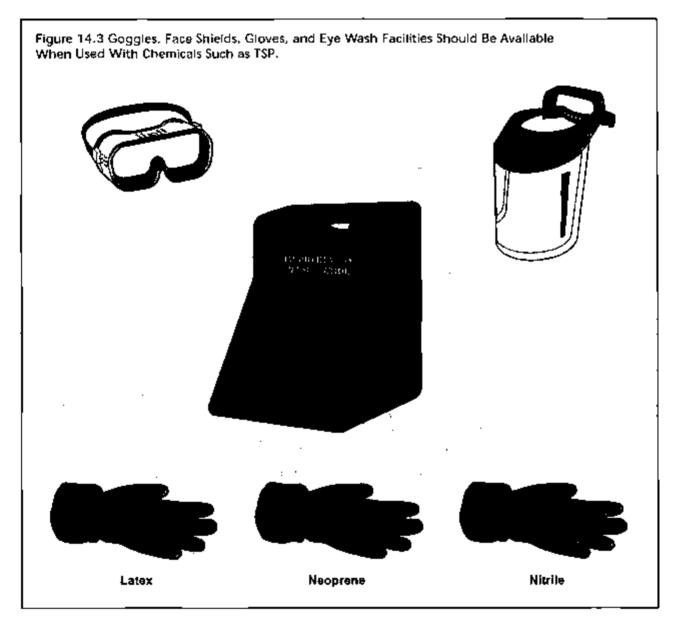
Proper Wet-Cleaning Procedures

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 thomb, 5 gallons should be used to clean no





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 hexard 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.

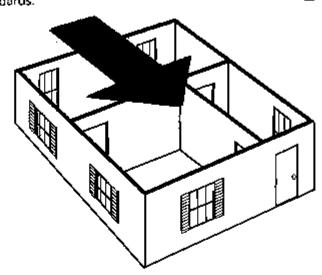


Chapter 14: Cleaning



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 entrence/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



Chapter 14: Cleaning =



- 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/wat wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wat 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.





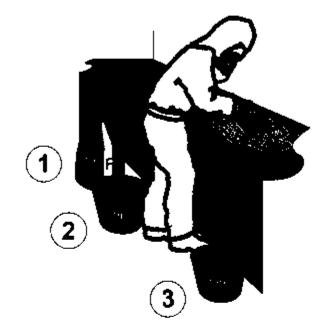
-- Chapter 14: Cleaning --



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

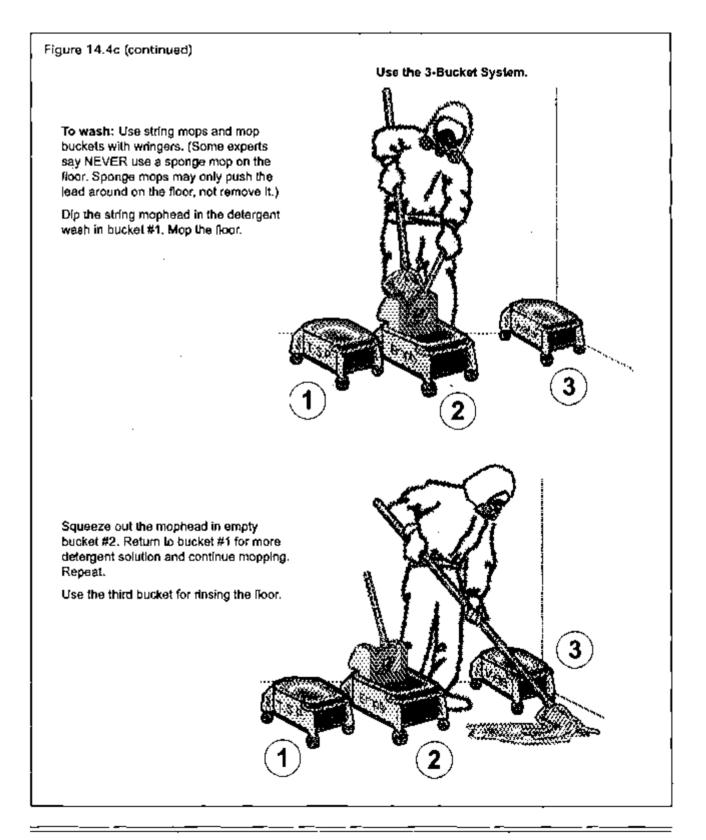


Don't Dry Sweep



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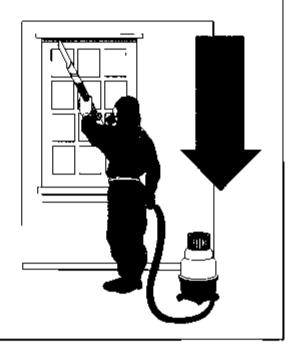
Chapter 14: Cleaning -



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.

Starling 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, finoleum, 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 viril tile, sheet viril, limpleum 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.

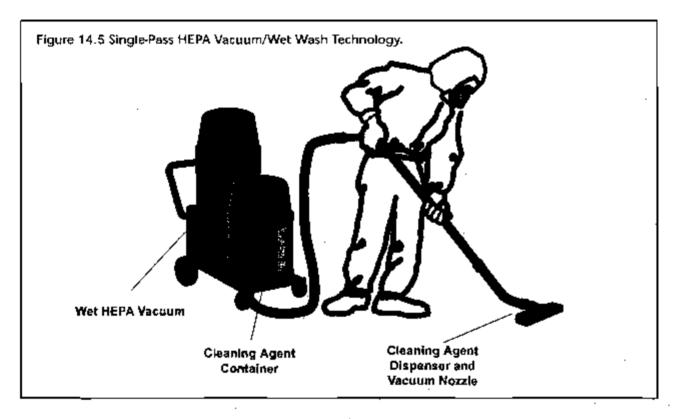
IV. Order of Cleaning Procedures During Lead Hazard Control

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-fead 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





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 vacuoming 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 schoduled 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 deily cleaning can be skipped in vacant dwelling units, it is required when occupants will



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

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.

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 wrapeath 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

Chapter 14: Cleaning



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-mill or double 4-mill 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 secner 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 ceilling 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.

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, toofs, 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 mophicads, 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.

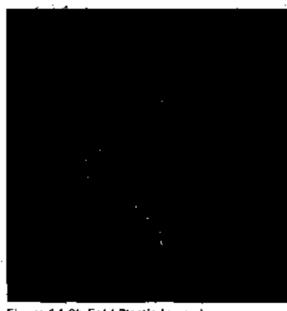


Figure 14.8b Fold Plastic Inward.

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 scaling 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 fead 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 scaled. 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 carofully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a cortified 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 Boors, and 33 percent for window troughs. The passifail 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 fallure is not solely related to abatement mothod. 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 sheating 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 comers 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 weddry 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 increated exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (n)(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 datargents 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	Eπcapsulation	Replacement	All Methods
Flaors	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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Chapter 14: Cleaning -



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

	Mass Removal Efficiency Percentages					
Cycle Number	Cleaning Method					
	Central Vacuum—Plain Tool	Central Vacuum—Agilator 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

Army Facilities Management Information Document on On Mold Remediation Issues

TG 277 FEBRUARY 2002



ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

INTRODUCTION	Z
MOLD PREVENTION TIPS	3
REMEDIATION PLANNING	3
REMEDIATE MOISTURE AND MOLD PROBLEMS	3
REMEDIATION PROCEDURES	4
FOUR REMEDIATION LEVELS	4
HAZARD COMMUNICATION	
CONCLUSION	10
REFERENCES	10
APPENDIX A: WATER DAMAGE CLEANUP AND MOLD PREVENTION,	11
APPENDIX B: MOLD REMEDIATION GUIDELINES	14
APPENDIX C: PERSONAL PROTECTIVE GUIDANCE	17
APPENDIX D: CONTAINMENT CUIDANCE	19

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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 alr 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 molsture 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 ft²) follow Level I guidance for PPE and containment and for a areas (>10 ft²) follow Medium (Level II) or when greater than 100 ft² 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.

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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 fined 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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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.

WagianD	amage - Cleanup and Mind Prevention (* 1884)
Guidelines for Response to Mold Growth£	Clean Water Damage within 24-48 Hours to Prevent
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.

		for Remediating Building Materi Growth Caused by Clean Water	
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Aquipment	Containment
	MALL - Total S	surface Area Affected Less Than 10 square (feet (ft ¹)
Books and papers	3	!	
Carpet and backing	1,3] 1	
Concrete or ainder block	1,3]	
Hard surface, purous fluoring (hisoleum, ornando (He, vinyl)	1,2,3	Minimum N-95 respirator, gloves, and googles	•
Non-porous, bard surfaces (plastics, metals)	1, 2, 3		None required
Upbolstered furniture & drapes	1, 3		
Wallhoard (drywal) and gypsum- board)	3	_	
Wood surfaces	1, 2, 3		

MEDIUM - Total Surface Area Affected Between 10 and 100 ft ²					
Books and papers	3				
Carpet and backing	1,3,4]			
Concrete or cinder block	1,3]			
Hard surface, porous flooring (Unoleum, ceramic tile, vioyi)	1,2,3	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 are		
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	7			

LARGE - Total Surface Area Affected Greater Than 100 ft² or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant

Books and papers	3		
Carriel and backing	1,3,4		
Concrete or cluder block	1,3	Full	Full
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider	Use professional judgment, consider
Non-porous, hard surfaces (plastics, metals)	1.2,3	potential for remediator/occupant exposure and size of contaminated area	potential for remediator exposure and size of contaminated area
Uphoistered furniture & drapes	1.2,4		
Waliboard (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 consuit 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).

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.

- 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 (ft²) 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

TG 277 Feb 02

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 ft² 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.

TG 277

February 2002

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278 February 2002



Table of Contents

Introduction	2
Safety Tips While Investigating And Evaluating Mold And Moisture Problems	2
Communicate With Building Occupants At All Stages Of Process, As Appropriate	3
Routine Investigation And Evaluation Of Moisture And Mold Problems	3
Assessments Requiring Sampling	3
References	4
APPENDIX A: Mold Investigation Decision Logic	5
APPENDIX B: Mold Remediation Guidelines	8
APPENDIX C: Personal Protective Equipment	. 1 1
APPENDIX D: Containment Guidance	11

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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 contamination².

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

- 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 appropriate¹.

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 problems³.

- 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 contamination².

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 air⁴. 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 Control⁴."

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.

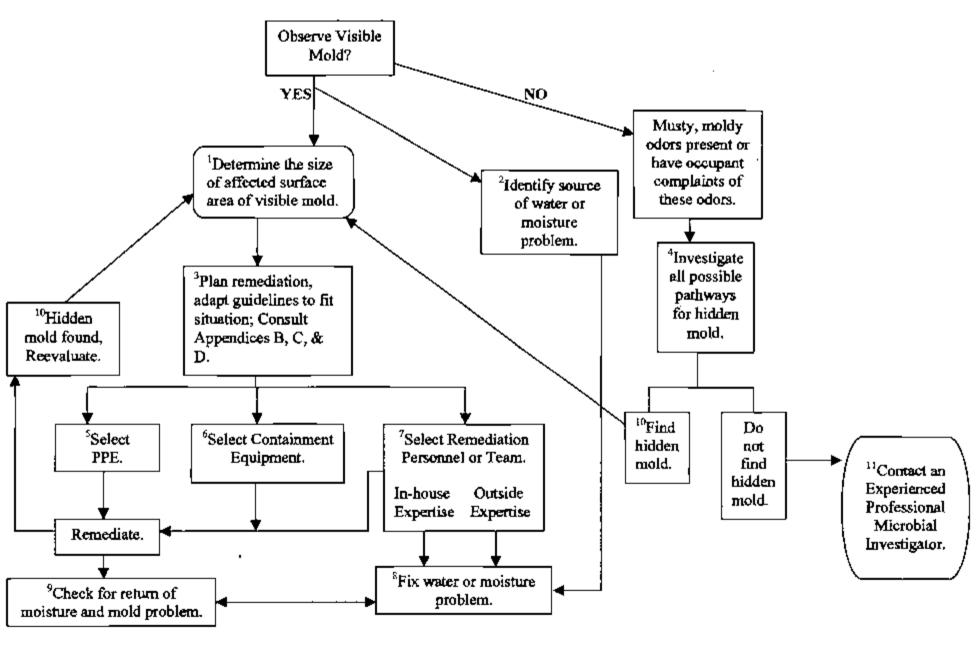
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- USACHPPM Technical Guide 277, Army Facilities Management Information Document on Mold Remediation Issues, February 2002.
- 2. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: 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): Biogerosols: 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.
- 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 activities³. Confirm negative pressure with smoke tubes.
- 7. Select remediation personnel who have the experience and training needed to implement the remediation plan.
- You must completely fix or eliminate the water or moisture problem to solve the problem.
- You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.
- 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 gnidelines 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.

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment			
	SMALL - Total	Sarface Area Affected Lem Taga 10 squar	e feet (ft ²)			
Books and papers	3]	_			
Carpet and backing	1,3]				
Concrete or einder block	1,3	·				
Hard surface, perous flooring (lindeum, ceramic tile, vinyl)	1, 2, 3	Minimuto				
Non-porous, hard surfaces (plastics, metals)	1, 2, 3	N-95 respirator, gloves, and guggles	None required			
Johnstered furniture & drapes	. 1,3	<u> </u>				
Waliboard (drywall and gypsum board)	3					
Wood surfaces	1, 2, 3					
	MEDIUM - 7	otal Surface Area Affected Between 10 and	100 ft ²			
Books and papers	3	<u>.</u>				
Carpet and backing	1,3,4	<u>.</u>				
Concrete or cinder block	I,3	d ,,_,,,,,,,,,	Limited			
Hard surface, per one flooring (linoleum, ceramic tile, vinyl)	1,2,3	Limited or Full Use professional judgment, consider	Use professional judgment, consider			
Non-porous, hard surfaces (plastics, motals)	1,2,3	potential for remediator exposure and size potential for remediator/occu exposure and size of contaminat				
Upholstered furniture & drapes	1,3,4					
Waliboard (drywali and gypsum board)	3,4					
Wood surfaces	1,2,3		<u> </u>			
EAR Incressed Oc	lGE - Total Sur capant or Remo	ince Area Affected Geenter Than 100 ft ² or effator Exposure During Remetlation Park	Potential for matted to be Significant			
Books and papers	3					
Carpet and backing	1,3,4	1				
Concrete or cinder block	1,3	Pull	Full			
Hard surface, perous flooring (linoteum, ceramic tile, vinyl)	1,23,4	Use professional judgment, consider potential for remediator/occupant exposure	Use professional judgment, consider potential for remediator exposure and si			
Non-porous, hard surfaces (plastics, metals)	1,2,3	and size of contaminated area	of contaminated area			
Upholstered furniture & drapes	1,2,4]				
Waliboard (drywall and gypsum board)	3,4					
Wood surfaces	1,23,4] .				

*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 20011

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eve 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 eve 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.

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 (ft²) 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 ft² 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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NGB-ARS-IHNE (40-5f)

4 March 2009

EXECUTIVE SUMMARY
INDUSTRIAL HYGIENE SURVEY
LIMITED ASBESTOS AND SURFACE LEAD DUST EVALUATION
OLD TOWSON ARMORY
TOWSON, MARYLAND
9 JANUARY 2009

- 1. PURPOSE. The purpose of this survey was to document the location and approximate amount of thermal system insulation (TSI) that meets the definition of presumed asbestos containing material (PACM); assess surface dust for lead contamination in the converted indoor firing range and adjacent areas; and notate general health and safety observations in the Old Towson Armory.
- 2. CONCLUSIONS. Gross contamination from repeated sewer line backups into the garage poses a health threat to personnel. Repeated water intrusions have weakened the structural integrity of one stairway, damaged other areas, and can serve as a source of mold growth in other locations. PACM is present throughout the Armory with many pipes improperly sealed and vinyl asbestos tile (VAT) floors not properly maintained. Implementation of the recommendations listed in this report will contribute to the health and safety of personnel entering these areas.
- 3. FINDINGS AND RECOMMENDATIONS.
 - Resilient Floor Covering.
 - (1) Repair the floor surfaces containing VAT. (RAC 2)
- (2) Maintain VAT floors following Occupational Safety and Health Administration (OSHA) guidance. (RAC 2)
- b. Family Support Group (FSG) Office. Inspect and repair the damaged ceiling in the FSG Office. (RAC 2)

c. Basement Contamination.

- (1) Identify and rectify the cause of sewer line backup into the Armory basement. (RAC 3)
 - (2) Remove wooden flooring in Room 1. (RAC 3)
 - (3) Repair radiator leaks in Rooms 1 and 2. (RAC 3)
- (4) Dispose of any porous materials contaminated by sewage backup in the cage and garage areas, and Rooms 1 and 2, to include wooden cage supports, (RAC 3)
- (5) Clean and sanitize the entire garage floor to include the cage areas and Rooms 1 and 2. (RAC 3)
- (6) Ensure personnel performing removal or cleaning operations in sewage contaminated areas are wearing adequate personal protective equipment. (RAC 3)
- d. <u>PACM</u>. Ensure proper procedures are followed if any repair/remediation aspects will disturb the PACM used as TSI on the pipes. (RAC 3)

e. Water Intrusion.

- (1) Determine and remediate the water intrusion source in the Room 4 closet and repair damage. (RAC 4)
- (2) Determine and remediate the water intrusion source in Room 110A closet, repair damaged areas, and clean and disinfect the wooden flooring. (RAC 3)
- (3) Determine and remediate the source of water intrusion underneath the basement stairs. (RAC 4)
 - (4) Replace damaged structural stair components. (RAC 3)
 - (5) Seal the pipe chases that allow water intrusion into the garage area. (RAC 3)
 - (6) Repair the damaged floors and walls in the Dining Room (Rooms 107/108). (RAC 4)

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- REFERENCES. See Appendix A.
- 2. PURPOSE. The purpose of this survey was to document the location and approximate amount of thermal system insulation that meets the definition of presumed asbestos containing material (PACM); and to assess surface dust for lead contamination in the converted indoor firing range (IFR) and adjacent areas; and notate general health and safety observations in the Old Towson Armory.

3. GENERAL.

- a. Survey Personnel. This survey was conducted 9 January 2009 by Non-Responsive, Industrial Hygienist; and Non-Responsive Certified Industrial Hygienist (CIH) both from the United States Army Center for Health Promotion and Preventive Medicine-North (USACHPPM-North), Fort George G. Meade, Maryland and Non-Responsive from the National Guard Bureau (NGB), Region North Industrial Hygiene Office, Havre de Grace, Maryland.
- b. <u>Background</u>. The NGB Region North Industrial Hygiene Office, Havre de Grace, Maryland as part of their ongoing evaluation of surface lead dust contamination in former IFRs, contracted CHPPM-North to perform this survey.
- c. Risk Assessment Codes (RACs). RACs are assigned to recommendations to help quantify risks to personnel and to aid in the establishment of funding priorities for corrective actions. RACs are determined by using the RAC tables from the Department of Defense Instruction (DODI) 6055.1 (reference 1). The Health Hazard Severity table is provided in Appendix B of this report.
- d. <u>Assessment Criteria</u>. The United States Army, through DODI 6055.1, Section E3.4.1.2, directs that facilities provide healthful work environments in accordance with the most stringent standards applicable (reference 1). The Occupational Safety and Health Administration (OSHA), through the Code of Federal Regulations, have enforceable regulatory standards for workplace safety

(reference 2). The NG Pam 420-15 is not an enforceable regulatory standard that can be applied to the occupational health and safety program for Old Towson Armory; however, it does provide useful recommendations for the cleaning and conversion of former indoor firing ranges (reference 3).

- e. <u>Illustrations</u>. Illustrations are provided in Appendix C.
- f. <u>Asbestos inventory</u>. Locations of presumed asbestos containing material (PACM) for thermal surfacing insulation (TSI) are provided in Appendix D.
- g. <u>Surface Wipe Sampling for Lead</u>. Surface wipe samples were collected following the guidelines in Chapter 2, Appendix II:2-1 of the OSHA Technical Manual (reference 4). Locations and results of surface wipe sampling for lead are provided in Appendix E.
 - h. Photographs. Photographs are provided in Appendix F.
- 4. PROCEDURES. The visit included a visual inspection of the pipe insulation determined to be asbestos containing building material (ACBM); surface wipe sampling for lead dust; and general health and safety observations.
- FINDINGS AND DISCUSSION.
- a. <u>TSI Inventory</u>. A visual inspection was conducted to document the type and condition of thermal surfacing insulation (TSI) in the armory. TSI of PACM was documented as to the location, condition, number of elbows, and linear feet and is presented in Appendix D. Rooms identified as containing PACM TSI are: Rooms 1 and 2 and the garage of the basement; the Drill Hall, Commo Office (Room 113); Male Latrine (Room 115), and Classroom (Room 116) of the first floor; and Office (Room 208) and Gym/Locker Room (Room 210) of the second floor (see Figures F-1 through F-23). The total PACM TSI observed on the pipes was estimated to be 638 linear feet, which included a total of 129 elbows (no RAC assigned).
- b. <u>Surface Contamination</u>. Eleven surface wipe samples collected from the furnishings and floors of the former IFR, adjacent areas, and the armory were analyzed for lead (see Figures F-25 through F-28). Results ranged from below detectable levels to 130 micrograms per square foot $(\mu g/ft^2)$ (see Appendix E). The samples from the former IFR ranged from 7.3 to 21 $\mu g/ft^2$. 29 CFR 1910.1025(h)(1) states that

all surfaces shall be maintained as free as practicable of accumulations of lead (reference 2) and NG Pam 420-15, paragraph 1-5, sets forth a goal of less than (<) 200 μ g/ft² (reference 3). All sample results were well below this value (RAC 5).

- c. <u>Bulk Sample</u>. The Environmental Protection Agency (EPA)/HUD action level for lead based paint is >0.5 percent (%) by mass in dried film (reference 5). The Consumer Product Safety Commission (CPSC) definition of lead containing paint is 0.06% by mass in dried or non-volatile portion (Health). The Army definition of lead contaminated paint is any detectable level of lead. A paint chip located on the ceiling above the drill hall and adjacent to the mezzanine appeared to contain a layer of older paint was collected and analyzed for lead content. The results of analysis determined the paint chip contained 0.05 percent lead (% Pb) by weight (RAC 4).
- d. <u>Air Sampling</u>. Air sampling for lead was conducted in the drill hall, mezzanine, and in the converted IFR. All results were below detectable limits (RAC 5).
- e. Resilient Flooring Material. The Old Towson Armory has multiple rooms with vinyl asbestos tile (VAT). These floor tiles vary in color and condition. For the most part the tile is damaged, scratched, or loose/dislodged, and appears not to have been maintained. Inventory of the flooring material was beyond the scope of this survey but was notated due to its abundance (see Figures F-29 through F-34). A standard interpretation for 29 CFR 1910.1001 dated 5 November 2007 reference OSHA compliance instructions concerning asbestos and includes instructions for maintaining VAT (reference 2) (RAC 2).
- f. Family Support Group, Room 123A. The ceiling in the FSG Office is in extremely poor condition. Plaster is loose and some has dislodged, there are multiple water stains, and areas where the sheetrock joints appear unstable and could collapse (Figures F-35 and F-36). This area should be inspected and repaired before being reoccupied (RAC 2).

g. Basement Contamination.

(1) The sewer lines serving the Armory tend to back up into the basement through a urinal located in Room 2. The sewage overflows into Room 1 and into a larger portion of the garage area (see Figures F-37 through F-42). There is evidence of repeated backups into the entire area to include these rooms, the cage areas, and the main garage floor and have left a build-up of fecal residue (RAC 3).

- (2) The plywood flooring in Room 1 is an elevated platform that was reportedly placed there due to the water and sewage intrusion. This wooden floor is contaminated with the sewage residue and should be removed and properly disposed of (RAC 3).
- (3) The caged area is also contaminated, to include the wood cage frames and contents. The cage areas should be emptied and the entire area cleaned and sanitized. Any wood or other porous material should be discarded (RAC 3).
- (4) The radiators located on the ceilings in both Rooms 1 and 2 are leaking. Keeping these areas wet will support growth from the fecal contamination. The radiators should be repaired. Special precautions should be instituted if asbestos remediation is involved (RAC 2).
- (5) Individuals performing remediation in these areas should wear personal protective equipment to avoid contamination. Precautions during remediation include avoiding aerosolizing the contaminated material; handwashing; wearing goggles, a N, R, or P95 respirator, watertight boots, and waterproof gloves. The cause of the backup should be identified and remediated to prevent future backups of this nature (RAC 3).
- (6) 29 CFR 1910.141(a)(3) (Sanitation), specifies that all places of employment shall be kept clean to the extent that the nature of the work allow. The floor of every workroom shall be maintained, so far as practical in a dry condition. In addition, all sweepings, solid or liquid wastes, refuse, and garbage shall be removed in such a manner as to avoid creating a menace to health and as often as necessary to maintain the place of employment in a sanitary condition (reference 2) (no RAC assigned).

h. Water Intrusion.

(1) Closets. The Room 4 closet is in a deteriorated condition and shows evidence of recurring water intrusion (Figures F-43 and F-44). The source of the water intrusion should be identified and remediated. The area under the stairway (Room 110A) has water damage from pipes. The source of the leak should be identified and repaired. The wooden floor should be cleaned and disinfected and repaired and sealed (Figures F-45 and F-46). The continued presence of water in the flooring and walls will support mold growth and can pose a risk to building mat-

erials, as well as health and should be remediated. USACHPPM Technical Guide (TG) 277 provides guidance on mold remediation issue (reference 5) (RAC 3).

- (2) Basement Stairs. The area underneath the wooden stairs in the basement is deteriorated due to recurring water intrusion. The source of the water should be identified and eliminated. One of the support beams is damaged and has weakened the integrity of the stairs structure. This support should be replaced (Figures F-47 and F-48). This continued water contact in the area will support mold growth and pose a risk to building materials, as well as to health and should be remediated (TG 277, reference 6) (RAC 3).
- (3) Foundation. Water intrusion through pipe access through the concrete foundation is numerous throughout the garage area and has resulted in extensive damage to the area. These openings should be properly sealed (Figure F-49). If water follows pipes to TSI, PACM will likely be damaged and could trigger fiber release episodes (reference 2) (RAC 2).
- i. Rooms 107/108. The dining room has extensive damage to the floor tile. Many areas of the wall have cracked and are in need of repair (Figures F-50 through F-52). The floor tile does not appear to be the type or age that would contain asbestos (RAC 4).
- 6. CONCLUSIONS. Gross contamination from repeated sewer line backups into the garage poses a health threat to personnel. Repeated water intrusions have weakened the structural integrity of one stairway, damaged other areas, and can serve as a source of mold growth in other locations. PACM is present throughout the Armory with many pipes improperly sealed and VAT floors not properly maintained. Implementation of the recommendations listed in this report will contribute to the health and safety of personnel entering these areas.

RECOMMENDATIONS.

- a. Resilient Floor Tile.
 - (1) Repair the VAT floor surfaces (reference 2). (RAC 2)
 - (2) Maintain VAT floors following OSHA guidance (reference 2). (RAC 2)

- b. FSG Office. Inspect and repair the damaged ceiling (reference 2). (RAC 2)
- c. Basement Contamination.
- (1) Identify and rectify the cause of sewage line backup into the Armory Basement (references 2 and 6). (RAC 3)
 - (2) Remove wooden flooring in Room 1 (references 2 and 6). (RAC 3)
 - (3) Repair radiator leaks in Rooms 1 and 2 (references 2 and 6). (RAC 3)
- (4) Dispose of any porous materials in the cage and garage areas, and Rooms 1 and 2, to include wooden cage supports and items contaminated by sewage (references 2 and 6). (RAC 3)
- (5) Clean and sanitize the entire garage floor to include the cage areas and Rooms 1 and 2 (references 2 and 6). (RAC 3)
- (6) Ensure personnel performing removal or cleaning operations in sewage contaminated areas utilize adequate PPE (references 2 and 6). (RAC 3)
- d. <u>PACM</u>. Ensure proper procedures are followed if any repair/remediation aspects will disturb the TSI PACM on the pipes (reference 2). (RAC 3)
 - e. Water Intrusion.
- (1) Determine and remediate the source of water intrusion in the Room 4 closet and repair damage (references 2 and 6). (RAC 4)
- (2) Determine and remediate the source of the water intrusion in the closet (Room 110A), repair damaged area, clean and disinfect the wooden flooring (references 2 and 6). (RAC 3)
- (3) Determine and remediate the source of water intrusion underneath the basement stairs (references 2 and 6). (RAC 4)
 - (4) Replace damaged structural stair components (reference 2). (RAC 3)

- (5) Seal pipe chases that allow water intrusion into the garage area (references 2 and 6). (RAC 3)
- (6) Repair the damaged floors and walls in the Dining Room (Rooms 107/108) (references 2). (RAC 4)
- 8. ADDITIONAL ASSISTANCE. Point of contact for this action and other industrial hygiene related topics is Ms. Non-Responsive NGB Regional Industrial Hygienist, (410) 942-0273, ext 23.



APPROVED BY:

Non-Responsive

NGB Regional Industrial Hygienist

APPENDIX A REFERENCES

- 1. Department of Defense Instruction (DODI) 6055.1, DOD Safety and Occupational Health (SOH) Program, 19 August 1998.
- 2. Title 29 Code of Federal Regulations (CFR), Part 1910, 2008 Edition, Occupational Safety and Health Administration (OSHA).
- 3. National Guard Pamphlet (NG Pam) 420-15, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, National Guard Bureau (NGB), 3 November 2006.
- OSHA Technical Manual (TED 01-00-015), 24 June 2008.
- 5. Residential Lead-Based Paint Hazard Reduction Act of 1992--Title X, Public Law 102-550, 28 October 1992.
- 6. US Army Center for Health Promotion and Preventive Medicine (USACHPPM), Technical Guide 277, Army Facilities Management Information Document on Mold Remediation Issues, February 2002

APPENDIX B RISK ASSESSMENT CODES DERIVING RISK ASSESSMENT CODES (RACs) FOR HEALTH HAZARDS

- 1. HEALTH HAZARD SEVERITY CODE (HHSC). Using the following procedures to assess points, determine the HHSC. The HHSC reflects the magnitude of exposure to a physical, chemical, or biological agent and the medical effects of exposure.
 - a. Exposure Points Assessed

AER	Exposure Conditions					
POSSIBLE 7*	<al<sup>†</al<sup>	Occasionally > AL Always < OEL [‡]	>AL ≤OEL	>OEL		
NO	0	3	5	7		
YES	1-2	4	6	9		

*AER = Alternate exposure route, such as skin absorption, ingestion.

[†]AL = Action level, DoD component threshold that triggers surveillance actions, such as microWatts/cm², dB, parts per million.

*OEL = Occupational Exposure Limit, DoD exposure limit, such as Threshold Limit Value and Permissible Exposure Limit.

b. Medical Effects Points Assessed

Condition	Points
No medical effect, such as nuisance noise and nuisance odor	0
Temporary reversible illness requiring supportive treatment, such as eye irritation and sore throat	1-2
Temporary reversible illness with a variable but limited period of disability, such as metal fume fever	3-4
Permanent, non-severe illness or loss of capacity, such as permanent hearing loss	5-6
Permanent, severe, disabling irreversible illness or death, such as asbestosis and lung cancer	7-8

c. Determine the HHSC by totaling the points assessed and using the following guide:

Total Points (sum of A and B, above)	ннѕс
13-17	1
9-12	11
5-8	III
0-4	IV

- 2. ILLNESS PROBABILITY CODE (IPC). Using the following guides to assess points, determine the IPC for health hazards. The IPC is a function of the duration of exposure and the number of exposed personnel.
- a. Duration of Exposure Points
 Assessed

	Exposure Duration					
Type of Exposure	1-8 hr/wk	>8hr/wk, not continuous	Continuous			
Irregular, intermittent	1-2	4-6	NA			
Regular, periodic	2-3	5-7	8			

b. Number of Exposed
 Personnel Points Assessed

Number of Exposed Personnel	Points
<5	1-2
5 to 9	3-4
10 to 49	5-6
>49	7-8

c. Determine the IPC for health hazards by totaling the points assessed and using the following guide:

Total Points (sum of A and B, above)	IPC
14-16	Α
10-13	В
5-9	С
< 5	D

3. Determine the RAC for health hazards by using the following matrix to account for HHSC and IPC.

HHSC	ILLNESS PROBABILITY CODE				
IIIISC	A	В	C	D	
	311		2	3	
	1	2	3	4	
- 111	2	3	4		
IV	3	4	5	1 5 60	

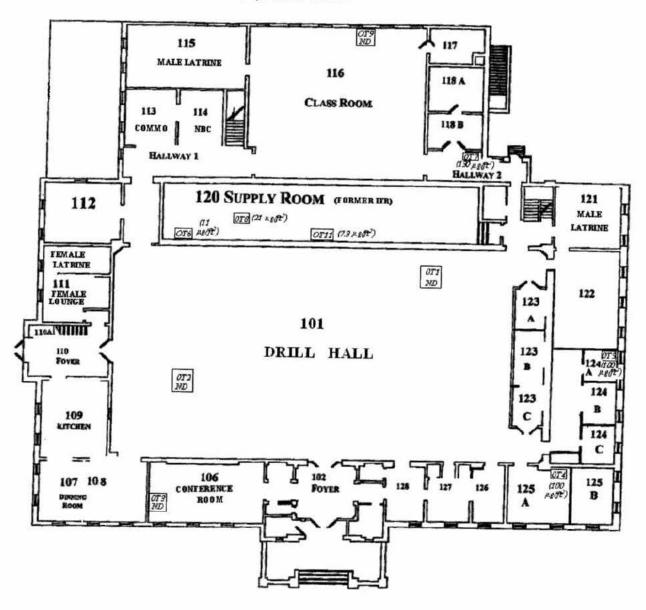
4. RAC Descriptor

RAC	DESCRIPTOR
321	CRITICAL
2	SERIOUS
3	MODERATE
4	MINOR
5 -	NEGLIGIBLE

From Table E7, T2 of Department of Defense Instruction 6055.1, Department of Defense Occupational Safety and Health Program, 19 August 1998 (reference 1).

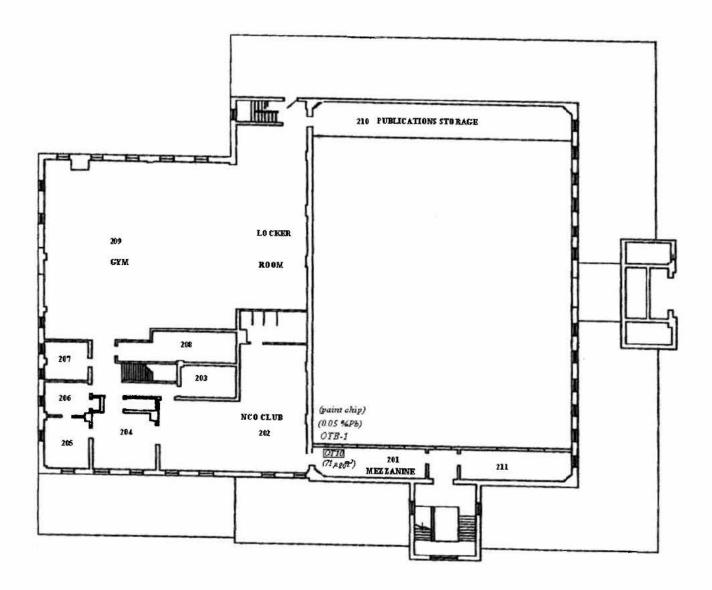
APPENDIX C ILLUSTRATIONS

Figure C-1: Old Towson Armory, First Floor.

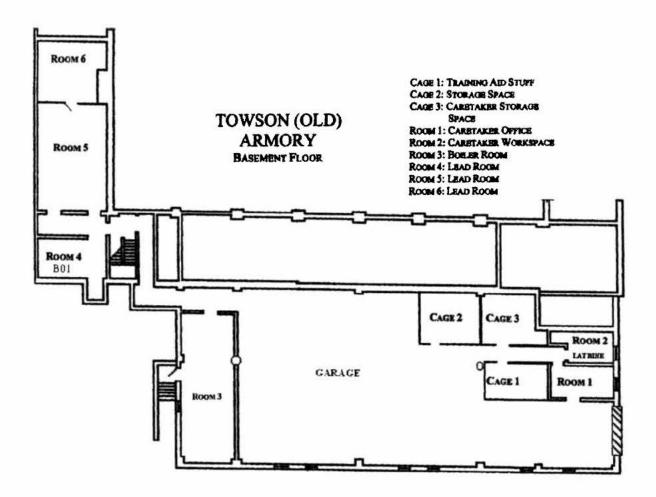


Appendix C, continued

Figure C-2: Old Towson Armory, Second Floor.



Appendix C, continued Figure C-2: Old Towson Armory, Basement.



APPENDIX D

OLD TOWSON ARMORY TSI INVENTORY

Table D-1. TSI Inventory, Basement

Room Number	Designation	Linear Feet	El- bows	Comments
Room 1	Storage Room	3.5	1	Damaged and open ended
Room 2	Restroom	72	18	Significantly damaged, open ended
Room 3	Boiler Room	0	0	No TSI observed
Room 4	Storage Room	0	0	No TSI observed
Room 5	Storage Room	0	0	No TSI observed
Room 6	Storage Room	0	0	No TSI observed
Garage	Vehicle Parking	342	54	Significantly damaged, open ended

TSI locations, length, and elbow numbers are estimated. Additional quantities may be present behind walls, in locked rooms, in flooring, or above drop ceilings.

Appendix D, continued

Table D-2. TSI Inventory, First Floor

Room	15 Inventory, Fir	Linear	El-	
Number	Designation	Feet	bows	Comments
101	Drill Hall	106	29	1 open elbow, 5 dam./open areas
102	Foyer	+ -0	T-0 -	No TSI observed
106	Conference Rm	0	0	No TSI observed
107/108	Office	0	0	No TSI observed
109	Kitchen		<u> </u>	No TSI observed
110	Foyer	0 7	0	No TSI observed
110A	Storage Room	0	_ _	No TSI observed
111	Women's	<u></u>	0	No TSI observed
112	Storage Room	0	0	No TSI observed
113	Commo/Office	10.3	4	1 ft open area, 1 damaged elbow
114	NBC Room	0	0	No TSI observed
115	Men's Room	34.9	·—	7 open ends, 1 repair with
		<u>, </u>	12	duct tape, 2 cracks at elbows
116	Classroom	16	0	damaged bottom, 3" np at bottom
117	Vault-Locked	0	0	No Access
118A	Vault-Locked	<u>o</u>	0	No Access
118B	Vault-Locked	0	0	No Access
121	Men's Room	0	0	No TSI observed
122	Supply Room	0	0	No TSI observed
123A	Family Support	0	0	No TSI observed
123B	Office	0	0	No TSI observed
123C	Storage Room		0	No TSI observed
124	Offices	0	o_]	No TSI observed
125A	Office	0	0 (No TSI observed
125 B	Office	0	0	No TSI observed
126	Office	0	0	No TSI observed
127	Office	0	0	No TSI observed
128	Office	0 [o	No TSI observed
128A	Storage Room	0	0	No TSI observed
129	Restroom	0	0	No TSI observed

TSI locations, length, and elbow numbers are estimated. Additional quantities may be present behind walls, in locked rooms, in flooring, or above drop ceilings.

Appendix D, continued

Table D-3. TSI Inventory, Second Floor

Room Number	Designation	Linear Feet	El- bows	Comments
201	Storage	0	0	No TSI observed
202	NCO Club	0	0	No TSI observed
203	NCO Club Storage (locked)	0	0	No Access
204	Locked	0	0	No Access
205	Locked	0	0	No Access
206	Locked	0	0	No Access
207	Locked	0		No Access
208	Office/Storage	18.4	1	1 Open end closest to wall entry
209	Locker Room/Workout	35	10	3 damaged areas repaired w/duct tape, 4 areas open and unrepaired, 1 properly repaired area
210	Publications	0	o	No TSI observed
211	Locked	0	0	No Access

TSI locations, length, and elbow numbers are estimated. Additional quantities may be present behind walls, in locked rooms, in flooring, or above drop ceilings

Facility Total TSI: 638.2 linear feet 129 Elbows

APPENDIX E

SAMPLE RESULTS

Figure. Surface Wipe Sample Results for Lead.

Sample Location	Sample ID	Results (µg/ft²)	Accep- table?*
Drill Hall Floor (closest to IFR)	OT1	< 6.8	Yes
Drill Hall Floor (other side, 3 pt line)	OT2	< 6.8	Yes
Rm 106, Conference Rm (Top of speakers by temp wall)	ОТЗ	< 6.8	Yes
Room 125A, Locker 171	OT4	100	Yes
Room 124A (Top Shelf)	OT5	100	Yes
Supply Room (old IFR), back shelf, 2 nd from top	OT6	11	Yes
Hall by classroom and Room 118 (top of cabinet)	OT7	130	Yes
Floor Supply Room (old IFR)	OT8	21	Yes
Classroom (filing cabinet top, 3 rd window vault side)	ОТ9	< 6.8	Yes
Mezzanine filing cabinet nearest 202	OT10	71	Yes
Supply Room, middle of room, metal shelf top shelf	OT11	7.3	Yes
BLANK		< 0.75	N/A

^{*}OSHA recommends surface contamination be as low as practicable (reference 2). NG Pam 420-15 recommends surface contamination be less than $200\mu g/ft^2$ (reference 3).

See Appendix C for the locations of the surface wipe samples.

APPENDIX F

PHOTOGRAPHS

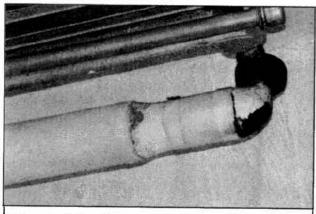


Figure F-1. Basement, Room 2

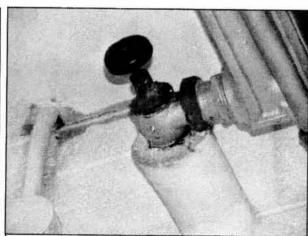


Figure F-2. Basement, Room 2

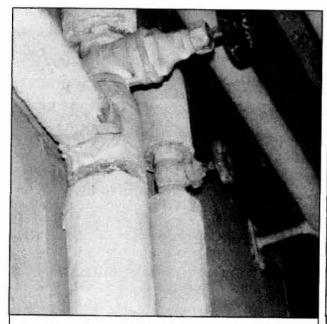


Figure F-3. Basement Room 2

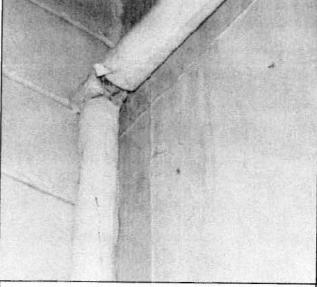


Figure F-4. Basement Room 2

APPENDIX F, continued

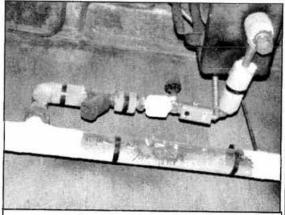


Figure F-5. Garage, heater



Figure F-6. Garage, heater

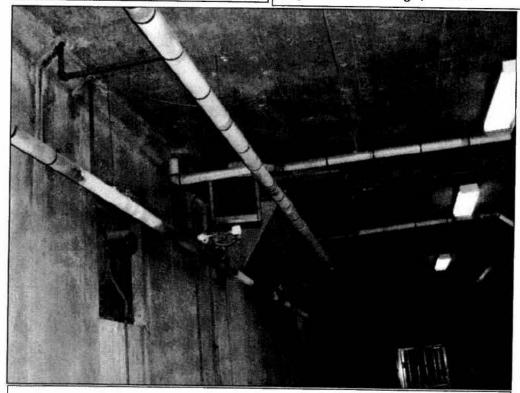


Figure F-7. Garage pipes with PACM TSI, note areas of water intrusion from pipes chases through the foundation.

APPENDIX F, continued



Figure F-8. Garage, pipes with TSI

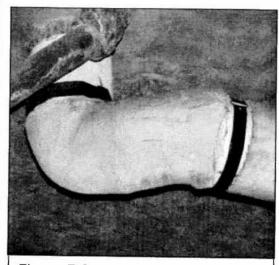


Figure F-9. Garage

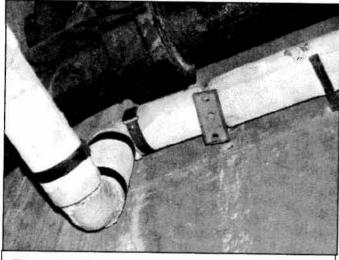


Figure F-10. Garage

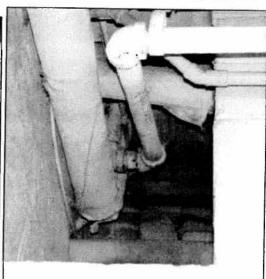


Figure F-11. Basement Hallway

APPENDIX F, continued

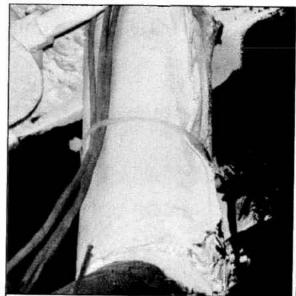


Figure F-12. Commo Office



Figure F-14. Male Latrine by stalls

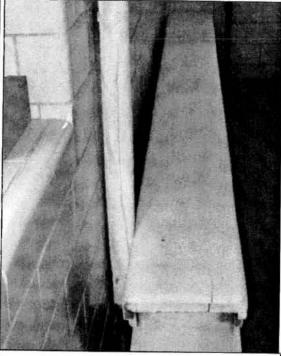


Figure F-13. Male Latrine by Shower Bench

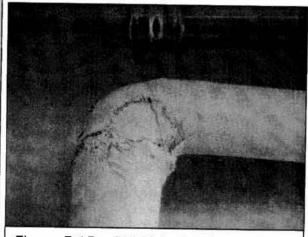


Figure F-15. Old Male Latrine

APPENDIX F, continued

Examples of exposed ACBM



Figure F-16. Old Male Latrine

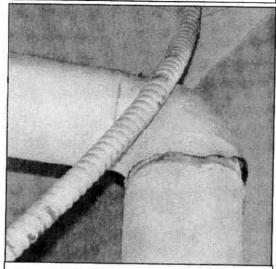


Figure F-18. Gym side



Figure F-17. Example of the heaters and TSI in the Gym

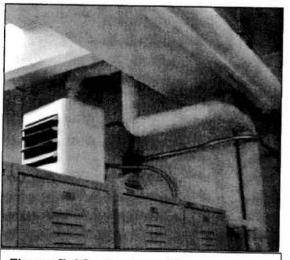


Figure F-19. Locker side

F-5

APPENDIX F, continued

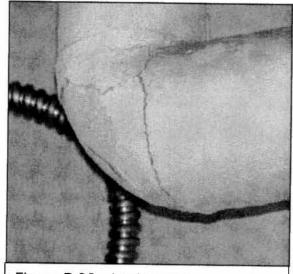


Figure F-20. Locker side



Figure D-21. Drill Hall

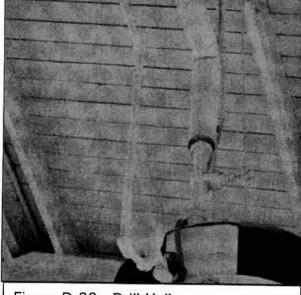


Figure D-22. Drill Hall

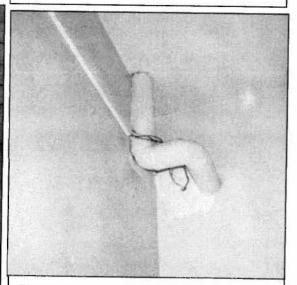


Figure D-23. Hallway 1

APPENDIX F, continued

Wipe Sample Locations

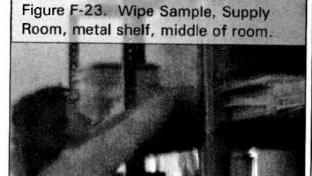


Figure F-25. Wipe Sample Room 125A, Locker 171



Figure F-27. Wipe Sample, Drill Hall



Figure F-26. Wipe Sample, Hall by Classroom and Room 118.



Figure F-28. Wipe Sample, back shelf, 2nd from top.

APPENDIX F, continued

Vinyl Asbestos Tile

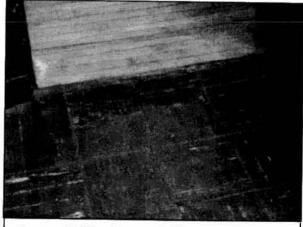


Figure F-29. Room 122

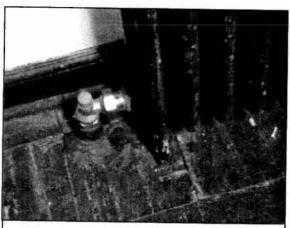


Figure F-30. Room 122

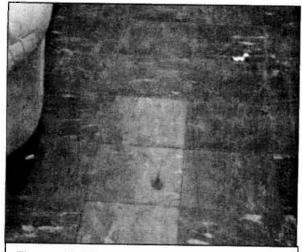


Figure F-32. Room 124



Figure F-31. Room 122

APPENDIX F, continued

Vinyl Asbestos Tile



Figure F-33. Room 112

Family Support Group

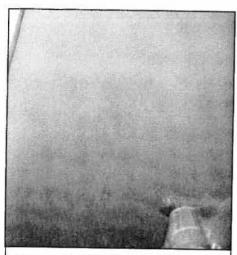


Figure F-35. Family Support Group, damaged ceiling

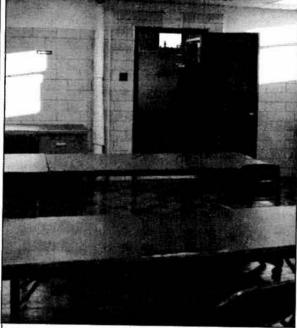


Figure F-34. Room 112

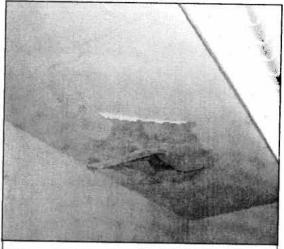
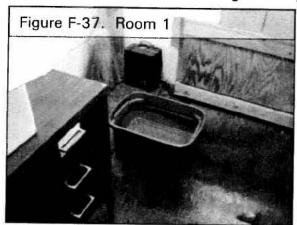


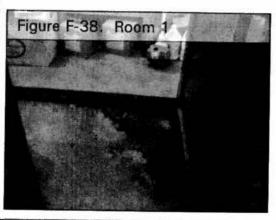
Figure F-36. Family Support Group, damaged ceiling

F-9

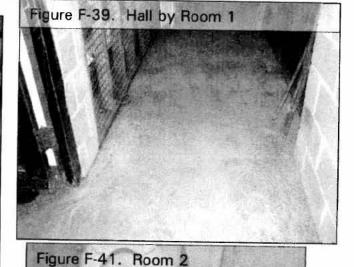
APPENDIX F, continued

Fecal Contamination from Sewage Backup







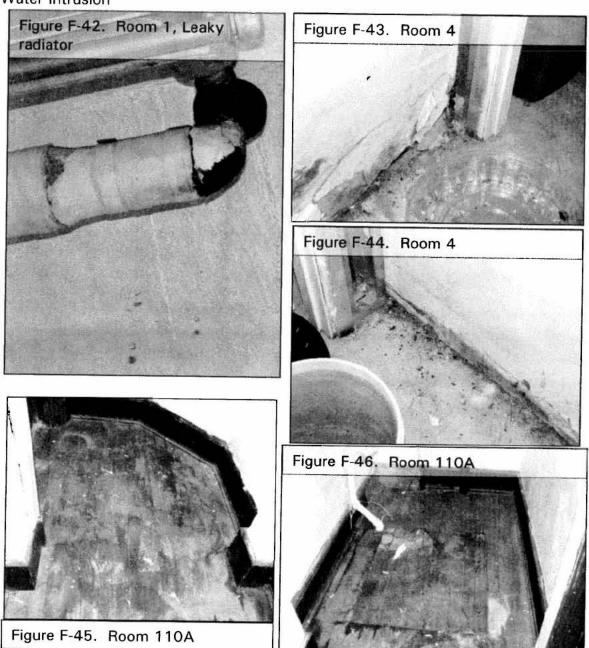


F-10

NGB-ARS-IHNE – Industrial Hygiene Survey, Limited Asbestos and Surface Lead Dust Survey, Old Towson Armory, Towson, Maryland, 9 January 2009

APPENDIX F, continued

Water Intrusion



F-11

NGB-ARS-IHNE – Industrial Hygiene Survey, Limited Asbestos and Surface Lead Dust Survey, Old Towson Armory, Towson, Maryland, 9 January 2009

APPENDIX F, continued

Water Intrusion

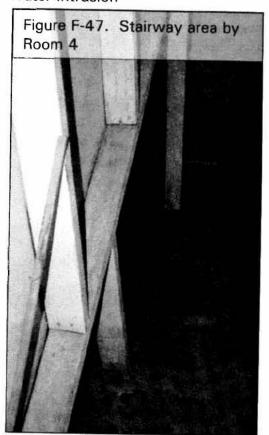




Figure F-49. Pipes through foundation causing water intrusion



F-12

NGB-ARS-IHNE - Industrial Hygiene Survey, Limited Asbestos and Surface Lead Dust Survey, Old Towson Armory, Towson, Maryland, 9 January 2009

APPENDIX F, continued

Dining Room

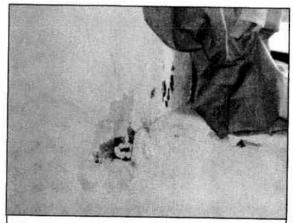


Figure F-50. Dining Room, wall and sill damage

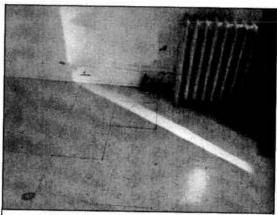


Figure F-51. Dining Room, floor and wall damage



Figure F-52. Dining Room



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Industrial Hygiene Survey

National Guard Facility Towson (old) Readiness Center 307 Washington Avenue Towson, MD 21204-4765

Prepared For:

National Guard Bureau Region North IH

301-IH Old Bay Lane

Havre de Grace, MD 21078

Survey Location:

Towson (old) Readiness Center

307 Washington Avenue Towson, MD 21204-4765

Prepared By:

Analytical Laboratory Services, Inc.

3544 North Progress Avenue

Suite 100

Harrisburg, PA 17110

Survey Date:

June 10, 2010

Report Date:

July 22, 2010

ALSI Project #:

1006344

Non-Responsive

Director, Environmental Health & Safety

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Tuble of Contents

Section 1.0 Executive Summary
Section 2.0 Operation Description & Observations
Section 3.0 Noise Survey
Section 4.0 Lead Testing
Section 5.0 Lighting
Section 6.0 Indoor Air Quality
Section 7.0 Suspect Ashestos Containing Building Materials
Section 8.0 Maintenance Bay
Section 9.0 Ventilation Assessment
Section 10.0 Limitations
Appendix A. Laboratory Analysis Report
Appendix B. Photographs
Appendix C. Floor Plan
Appendix D. References

Section 1.0 Executive Summary

An industrial hygiene survey was conducted June 10, 2010, at the Readiness Center Facility located at 307 Washington Avenue Towson, Maryland 21204-4765. The study was performed by MrNon-Responsive CIH.

- 1. Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft² in the following locations:
 - a. Drill Hall Conference Room Top of Storage Container;
 - b. 1st Floor Classroom Table (Note: rifles cleaned in this location);
 - c. 2nd Floor Gym/Weight Room Window Sill

Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft².

- 2. Employees were not performing tasks that provided excessive noise levels, as such; noise exposure monitoring was not conducted.
- 3. Lighting within the facility was evaluated. Lighting levels met the minimum recommended guidelines in all but three areas: 1) Kitchen, 2) Weight Room, & 3) Garage. Lighting should be improved in these areas.
- 4. 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% and temperature exceeded the recommended criteria of 79 degrees F in some indoor locations. There is no central air conditioning system in this building. Outdoor conditions were hot and humid. 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. For comfort, temperature levels should be maintained between 73-79 degrees F. 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).
- 5. 9" by 9" floor tile in the supply office was damaged and in poor condition. This could be a potential source of asbestos fiber release and should be professionally abated.

Section 2.0 Operation Description & Observations

The Towson (Old) Readiness Center primarily serves primarily as an office setting and equipment storage facility. The facility consists of offices, a drill hall, garage, and storage areas. There are three full-time employees stationed at the facility. On drill weekends there can be 70-130 occupants.

The building was initially constructed in 1938. The exterior of the building is stone/masonry. The interior walls are primarily concrete block, stone and plaster. The heating, ventilating, and air conditioning system (HVAC) consisted of a few window unit air conditioners and a boiler with radiators. Outdoor air ventilation occurs via open windows, doors, etc. No forced-air ventilation system is present. The floors were composed of a poured concrete slab. Some areas were finished with vinyl floor tiles or hard wood flooring. The ceilings were generally composed of wooden roof deck and in some 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.

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

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.

Section 3.0 Noise Survey

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

Section 4.0 Lead Testing

At the time of the assessment, no activities were observed which would generate lead exposure. Soldiers 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. 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	Paint Chip %Pb
<u></u>	Assembly/Drill Hall Window Sill	. •	<110	
. 2	Kitchen Prep Table		<110	
3	Supply Room Office AC Supply		<110	
4	Drill Hall Entryway Bookshelf		<110	
· 	Drill Hall Conference Room - Top		1,100	
5	of Storage Container		1	
6	Firing Range - Light Fixture		<110	
7	Firing Range Stored Items	· ·-·· ·	<110	
8	Firing Range – Floor		<110	-1
	Outside Firing Range Floor		10	· -
10	I ^{SI} Floor Classroom - Table		240	•
11	2 ^{itd} Floor Army Club - Bar Table		<110	:
	2 nd Floor Gym/Weight Room		1,300	
12	Window Sill		•	
17	Blank		<12 ug	
	2 ^{e3} Floor Room 207 – Peeling		J	0.074
13	Paint on Coiling			
14	Drill Hall	Void	-,	
15	Firing Range	<4. I		"
16	Blank	<3 ug		
Criteria		50	200	0.5

Key: Bolded results exceed listed criteria-

Surface levels of lead exceeded 200 ug/ft² in the following locations:

- 1. Drill Hall Conference Room Top of Storage Container;
- 2. 1st Floor Classroom Table;
- 3. 2nd Floor Gym/Weight Room Window Sill

The National Guard Bureau currently utilizes 200 ug/ft² 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/ft² 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/ft² on floors and 250 ug/ft² 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/m³. In fact, no detectable level of lead was identified in the air sample collected.

Deteriorated paint was observed at various locations throughout the facility. Delaminated paint was mostly due to age along with prolonged exposure to elevated relative humidity levels. A paint chip sample was collected from the 2nd Floor Room 207. Low levels of lead were detected in the sample collected. However, 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/ft². Emphasis should be placed on the 1st floor classroom area where it was reported that rifle cleaning is performed. Deteriorated and peeling paint should be properly remediated and repaired.

Section 5.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400f. 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
Conference Room	98	30-50	Yes
1 st Sergeant Office	80	30-50	Yes
Readiness/NCO Office	49	30-50	Yes
Old Firing Range (Storage)	43	30	Yes
Latrine (1st Floor)	26	5	Yes
Drill Floor	33	30-50	Yes
Kitchen	35	50	No
1stFloor Storage	64.5	30	Yes
1 st Floor Classroom	54.2	30-50	Yes
Exercise/Weight Room	15	30	No
PSG Office	40.7	30-50	Yes
Office 208	91.9	30-50	Yes
Room 207	87.4	30-50	Yes
Garage	12.9	75	No

Lighting levels met the minimum recommended guidelines in all but three areas: 1) Kitchen, 2) Exercise/Weight Room, 3) Garage. Lighting should be improved in these areas.

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 75.1 to 80.6 degrees F with relative humidity readings ranging from 47% to 63%. During the survey, carbon dioxide (CO₂) levels ranged from 412 ppm to 632 ppm within the facility compared to an outdoor CO₂ level of 390 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO₂ recommended is 1,090 ppm (390 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 flumidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ррш)
Conference Room	76.8	53	563	0
First Sergeant Office	76.6	59.4	508	0
Readiness/NCO	75,1	47	562	0
Old Firing Range (Storage)	76.6	64	596	0
Latrine	76.8	63	468	Ω
Drill Ploor	79.4	57.7	632	0.1
Kitchen	78.2	56.7	454	0
1st Floor Storage	78	58.9	426	0
1 st Floor Classroom	78	60.4	438	0
2 nd Floor Gym	79.7	54.6	412	0.2
PSG Office	80	55.5	432	0
Office 208	80.2	55.7	436	0
Room 207 - Sleep Quarters	80.6	54.1	493	0
Garage	78.2	60.6	438	0.1
Outdoors	84.2	43	390	0
Criteria	73.0-79.0	30-60	<1,090	<9.0

Key: Bolded results exceed listed criteria

Relative humidity exceeded the recommended ceiling of 60% and temperature exceeded the recommended criteria of 79 degrees F in some locations. There is no central air conditioning system in this building. Outdoor conditions were hot and humid. 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.

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. Water damage was observed in some 2nd floor areas on the ceiling and windows. No current water leaks were noted. It was reported that the water stains were from past water leaks that have been repaired.
- 2. No areas of fungal growth were observed.

All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

Section 7.0 Suspect Asbestos Containing Building Muterials

Suspect asbestos containing materials (ACM) include sheetrock/joint compound, plaster wall and ceiling systems, floor tiles and associated mastic, and vinyl covebase. 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 was suspected. No samples were collected.

The following suspect ACM was noted at the time of this survey:

- 1. 9" x 9" vinyl floor tile and mastic in various locations throughout the 1st and 2std floor. Approximately 3,500 ft² was observed. However, more could be present in hidden areas. Most of this material was in good condition. However, the floor tile in the supply office was damaged and in poor condition. This could be a potential source of asbestos fiber release and should be professionally abated.
- 2. 12" x 12" vinyl floor tile and mastic. Approximately 200 ft² of tile was observed. It is in good condition.
- 3. The boiler room was inspected. It appeared that all asbestos-containing materials were abated.

Section 8,0 Maintenance Bay

There is a garage area on the lower level of the facility. Maintenance activities are no longer performed in this area. It is used primarily for storage and parking. It was not apparent that any special clean up activity has been performed.

There is no local exhaust ventilation present. There are two exhaust fans in the wall. They were not in operation at the time of this survey. We recommend that the exhaust fans be repaired so that they could be used if needed.

Section 9.0 Ventilation Assessment

The facility has boiler operated radiant heating and window unit air conditioners. A closed system boiler is located in the boiler room. No issues were identified with the mechanical system components.

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 berein 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.

and Analytical Services, Inc.



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CERTIFICATE OF ANALYSIS



Methorial Guard Burrows	Job Name:	Old Terzson Armony	Chain Of Custody:	508053		
State Milliary Reserved for	Job Locacton:	Towson, MD	Date Submitted:	6/15/2010		10920
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	P.O. Number:	NGB-HINE	Dafe Analyzed:	6122/2010	6422/2010 Report Date: 6/28/2010	6/28/2010
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Air and Wipe results are not corrected for any blank results All results are to be considered preliminary and subject to Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

should not be considered when interpreting the result

change unless signed by the Technical Director or Deputy.

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torations, and collection protocols are based upon the information provided by the persons and completeness of these Laboratories, we converse provided by the persons and completeness of the information applies only to polarized light microscopy of bulk samples and the incressory of bulk samples and the incressory of bulk samples and transfer and the incressory of the Federal Covernment. All rights reserved. This export applies any to the example, or sample, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a nation to clients, the public, and those Laboratories, this report is submitted and accepted for the excepted for the excepted for the edenit or whom it is addressed and upon the condition that it is not to be used, in whole or in yarf, in any advertising or publicity matter without prior written anticontaction from us. Simple types, submitted and accepted for the excepted for the edenit or whom the calculation from the condition that it is not to be used, in whole or in yarf, in any advertising or publicity matter without prior written anticontaction from us. Simple types, AMA Analytical Services, Inc.

An AIHA (#100470), NVI.AP (101143-0), and NY ELAP (#10929) Accessified Laberalory 4475 Forbes Blvd. Lanham, MD, 20706 (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

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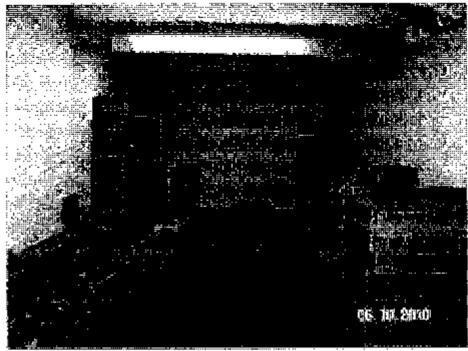
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Appendix B. Photographs

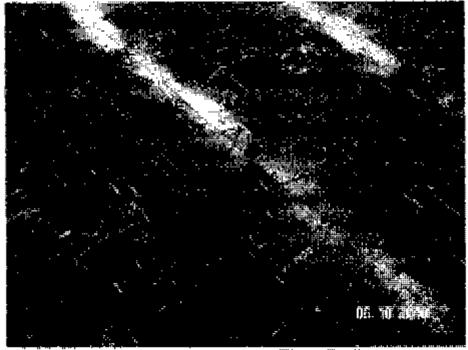




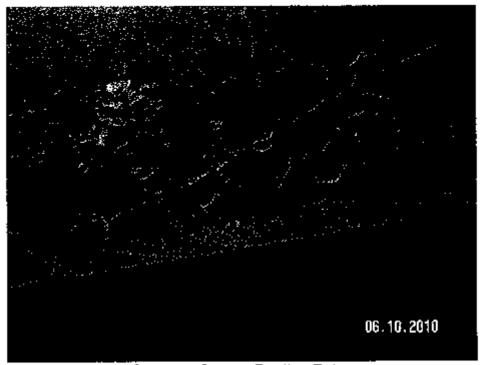
Damaged 9'X9' Floor Tile in Supply Office.



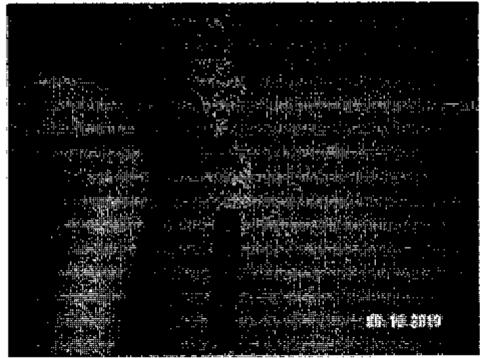
Firing Range.



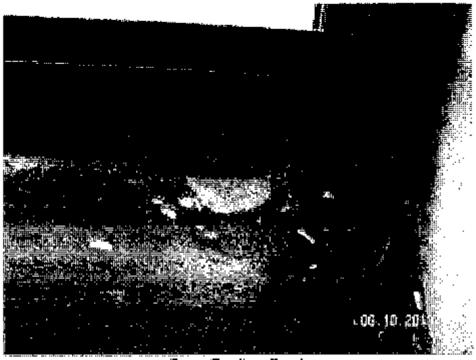
Most Common 9'X9' Floor Tile in Facility.



Sleeping Quarts, Peeling Paint.



Room 208. Peeling Paint.



Gym, Peeling Paint

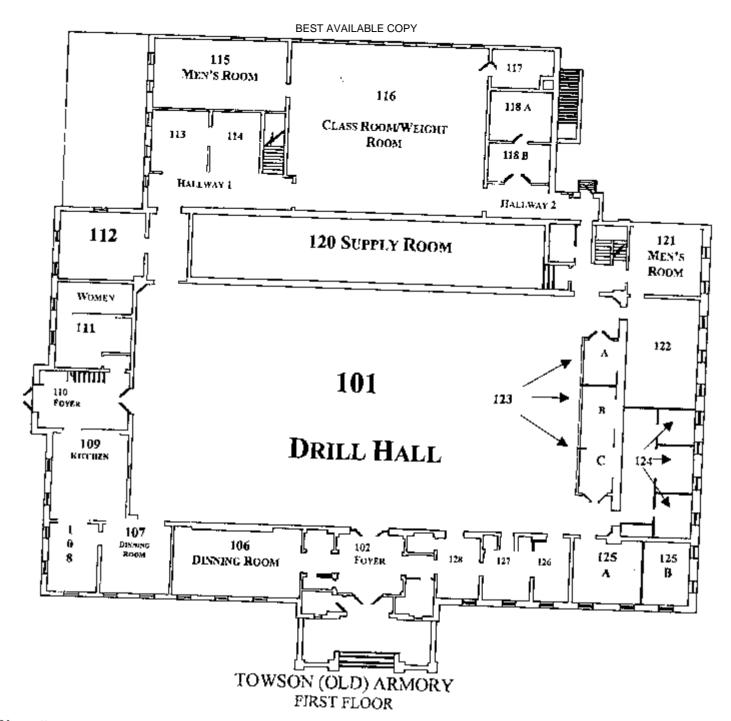


Garage/Storage Area

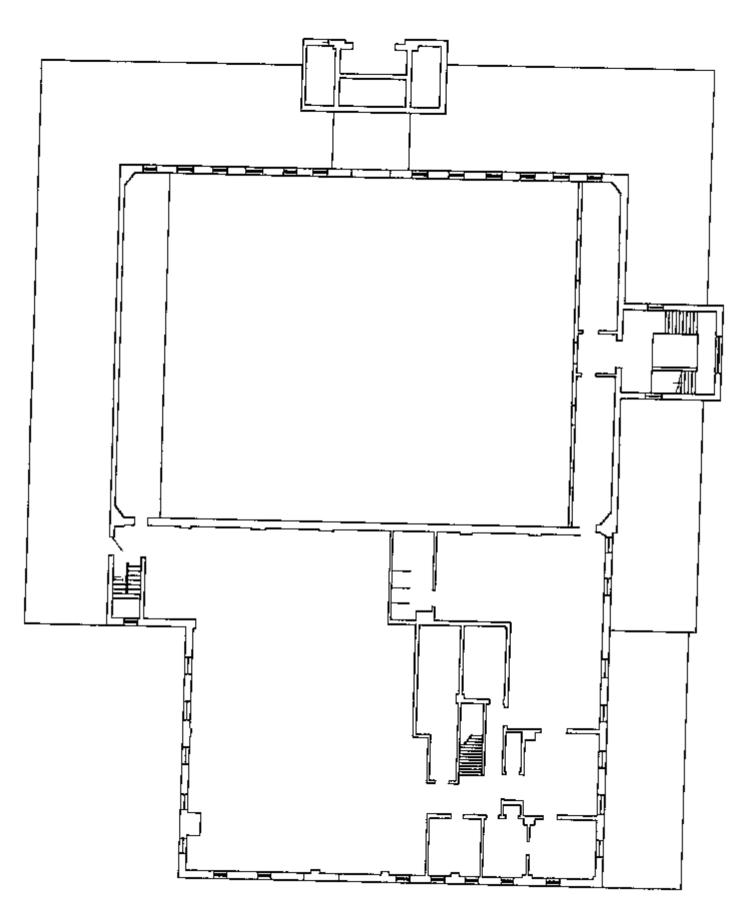


Garage/Storage Area, Exhaust Fan. Does Not Work.

Appendix C. Floor Plan



101 102 103 104 105 106 107 108 109 110 110 A (11 112	DRILL HALA. FRONT FOYER FRONT OUT SIDE STORAGE FRONT INDOOR STORAGE (LEFT SIDE) FRONT INDOOR STORAGE (LEFT SIDE) DINNING ROOM DINNING ROOM FOOD SERVING AREA KITCHEN SIDE FOYER SIDE STORAGE WOMEN'S ROOM	113 ANTI ARMORS ROOM 114 NBC ROOM 115 MEN'S ROOM 116 CLASS/WHIGHT ROO 117 NVG ROOM 118 A & B ARMS ROOM 119 TM LIBRARY ROOM 120 SUTPLY ROOM 121 MEN'S ROOM 122 COMPANY ORDERLY 123 A 123 B COMPANY MEDIC 123 C	125 A 125 B 126 127 M 128 128 A 129 H	STATE GUARD STATE GUARD STATE GUARD RECRUTING OFFICE CARE TAKERS OFFICE STORAGE ROOM MEN'S ROOM HANDICAP BATHROOM
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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 (ACGIII) 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)]
- 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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DEPARTMENT OF THE ARMY

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

0 7 MAR 2005

MCHB-TS-OFS

MEMORANDUM FOR Region North Industrial Hygiene Office (NGB-AVS-SI-IH/Ms. Non-Responsive, Army National Guard Bureau, 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-03/05, MG Henry C. Evans Armory, Westminster, MD

- 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.
- Some of the original color photographs may be hole-punched because the document was originally submitted in a notebook
- 4. Our point of contact is Ms. Non-Responsive at commercial (410) 436-5475/3118, DSN 584-5475/3118, or by e-mail: Non-Responsive @us.army.mil.

FOR THE COMMANDER:



Encl

Director, Occupational Health Sciences

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





MDARNG FACILITIES IH BASELINE SURVEY
MG HENRY C. EVANS ARMORY
WESTMINSTER, MD
55-ML-01ED-03-05











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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.

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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 INDUSTRIAL HYGIENE BASELINE SURVEYS PROJECT NO. 55-ML-01ED-03/05 MARYLAND ARMY NATIONAL GUARD FACILITIES WESTMINSTER ARMORY WESTMINSTER, MD 29 July 2003

1. PURPOSE OF EVALUATION. To conduct surveys at 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 a worker's history of exposures is provided for each civilian or military employee.

2. CONCLUSIONS.

- a. Lead. All air samples were below the laboratory reporting limit for lead in air of 6 μ g/m³ and the Occupational Health and Safety Administration (OSHA) standard of 50 μ g/m³ for lead in air. Two samples were above the Environmental Protection Agency (EPA) and State of Maryland lead exposure levels for children of 40 μ g/ft² on floors. One of six surface wipe samples was above the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) and National Guard Bureau Region North recommended decontamination level of 200 μ g/ft² for floors and other frequently contacted surfaces. This surface wipe sample was collected in the bullet trap area of the former converted indoor firing range, and the result was very high (1,364 μ g/ft²). Personnel who work in this room are potentially exposed to high levels of lead, and are tracking lead out of the area and redistributing lead into adjacent rooms in the armory. This can result in lead exposures to children and to the general workforce. 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.
- b. Safety hazards. The air conditioning units pose a potential safety hazard to young children. The chain on the drill floor garage door poses a potential safety hazard to people entering the area.
- 3. RECOMMENDATIONS. The Department of Defense Instruction Number 6055.1 provides Risk Assessment Codes (RACs) 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. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

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- a. Lead. The RAC for lead exposure in the former indoor firing range (IFR) area is classified as 4. Clean all areas in and adjacent to the former 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. 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. Recleaning all additional areas that showed high dust-lead levels may further prevent exposures for children and for the general workforce. 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 standard for young children of 40 µg/ft² on floors and clean to the USACHPPM decontamination level of 200 µg/ft² for dust-lead on all other surfaces. 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, Title 29 Code of Federal Regulations Part 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 Hazards. Address safety hazards posed by air conditioning units and the chain on the drill floor garage.

TABLE OF CONTENTS

Pa	ragraph	Page
1.	AUTHORITY	1
	PURPOSE OF EVALUATION	
	BACKGROUND INFORMATION	
4.	SUMMARY OF ACTIONS	1
5.	ASSESSMENT CRITERIA FOR LEAD	2
	SAMPLING RESULTS	
	DISCUSSION AND CONCLUSIONS	
	RECOMMENDATIONS	
9.	ADDITIONAL ASSISTANCE	4
En	aclosure	
1.	Lead Exposure	
2.	Additional Recommendations	
Αŗ	ppendices	
A.	ASSESSMENT CRITERIA FOR LEAD	A-1
	SITE MAPS	
	PHOTOGRAPHS	
	SAMPLING SHEETS AND LAB ANALYSES	
	REFERENCES	
	LEAD CLEANING GUIDANCE	
G	MOLD GUIDANCE	G-1

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

MCHB-TS-OFS

MEMORANDUM FOR Region 1 Regional Armory Manager (SGM Non-Responsive) 350 Hahn Road, MG Henry C. Evans Armory, Westminster, MD 21157-4699

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03/05

- 1. AUTHORITY. Email, MD Army National Guard (ARNG), Ms. Non-Responsive, 28 February 2003, subject: SAB
- 2. PURPOSE OF EVALUATION. To conduct surveys at ARNG 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 a worker's history of exposures is provided for each civilian or military employee.
- 3. BACKGROUND INFORMATION.
 - a. Armory Mission. Artillery.
 - b. Date of Construction, 1980.
- c. Facility Use by Children. The point of contact stated that there is potential use by children if the armory is rented.
- 4. SUMMARY OF ACTIONS.
- a. Sampling. Surface dust-lead wipe and air sampling was conducted to determine the existence of lead hazards. Sample locations are in Appendix D.
 - b. Physical Condition of Facilities.

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- (1) Paint. There is no deteriorated paint in the armory. We believe that lead-based paint was never applied to the walls in the armory. The Army stopped using lead-based paint in facilities in 1978.
 - (2) Asbestos. There are no records for asbestos containing materials in this armory.
 - (3) Mold. No mold was observed.
- (4) Safety Hazards. The air conditioning unit cases have to be pulled off in order to operate them. This presents a potential safety hazard of children putting their fingers into the fan. The chain on the drill floor garage can be cumbersome to operate and there is a potential for the door to drop onto people underneath.
 - c. Other Building Concerns. There were no other building concerns observed.
- d. Safety and Industrial Hygiene Programs. There are no written program records at the armory.
- e. Heating, Ventilation, and Air-conditioning System. Ventilation and air conditioning are provided mainly by window-mounted air conditioning units and the manual operation of windows when the building is not being heated. Heating is supplied by a gas boiler system.
 - 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.
- h. Converted indoor firing range (IFR). The former IFR is now being used as a garage that contains vehicles and a tractor, plus supplies.
- 5. ASSESSMENT CRITERIA. See Appendix A.
- 6. SAMPLING RESULTS. Lead in air and surface wipe sample results are in Appendix D. Two results were above the Environmental Protection Agency (EPA) lead exposure levels for children of $40~\mu g/ft^2$ on floors. One of six surface wipe sample results was above the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) and National Guard Bureau (NGB) Region North recommended decontamination level of $200~\mu g/ft^2$ for floors and other frequently contacted surfaces. One dust-lead level in the former IFR was very high. All air samples were below the laboratory reporting limit for lead in air of $6~\mu g/m^3$ as well as the Occupational Health and Safety Administration (OSHA) standard of $50~\mu g/m^3$ for lead in air.

See Table 1 for dust-lead wipe sample locations, photograph numbers, and analytical results. All sample results that are equal to or exceed $40 \,\mu g/ft^2$ are highlighted. Samples that are below the laboratory reporting limit are designated as <RL.

TABLE 1 Dust-Lead Wipe Sample Locations, Photograph numbers, and Analytical Results

Sample	Type of	Location	Photo	Result
Numbers	Sample		Number	μg/ft²
WR W01	Wipe	Top of desk in Recruiter's office (SFC Olsh)	1410	<rl< td=""></rl<>
WR W02	Wipe	Top of file cabinet in Room 3 B	1411	<rl< td=""></rl<>
WR W03	Wipe	Bullet trap area of former IFR	1412	1364
WR W04	Wipe	One foot from door to IFR	<mark>1414</mark>	132
WR W05	Wipe	Wall about 4 feet from door in former IFR	1415	<rl< td=""></rl<>
WR W06	Wipe	Workbench which is now in former IFR	1416	<rl< td=""></rl<>

7. DISCUSSION AND CONCLUSIONS.

- a. Most of the building is in good condition. The armory generally observes good housekeeping practices.
- b. All air sample results were below the laboratory reporting limit for lead in air of $6 \mu g/m^3$ as well as the OSHA standard of $50 \mu g/m^3$ for lead in air.
- c. One of six surface wipe samples exceeded the USACHPPM and NGB Region North recommended decontamination level of $200 \,\mu\text{g/ft}^2$ for floors and other frequently contacted surfaces. This elevated surface wipe sample was collected in the bullet trap area of the former converted indoor firing range. The lead level was very high (1,364 $\,\mu\text{g/ft}^2$) (photo # 1412). One additional wipe was located one foot away from the door entrance to the former IFR and exceeded the EPA lead exposure levels for children of $40 \,\mu\text{g/ft}^2$ on floors (photo # 1414).
- d. Personnel responsible for the storage in this room are potentially exposed to very high levels of 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 and for the general workforce.
- 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 air conditioning units pose a potential hazard to young children. The chain on the drill floor garage poses a potential hazard to people in the area.

- 8. RECOMMENDATIONS. See 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 Non-Responsive @us.army.mil.

Non-Responsive, M.S.
Industrial Hygienist
USACHPPM Lead and Asbestos Team Leader
Industrial Hygiene Field Services Program

APPROVED:

Non-Responsive , CIH

Technical Manager Industrial Hygiene Field Services Program

WESTMINSTER ARMORY RECOMMENDATIONS

The Department of Defense Instruction Number (DODI) 6055.1 provides Risk Assessment Codes (RACs) 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. The 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 area is classified as 4.

1. Lead Exposure. RAC 4.

- a. Clean all areas in and adjacent to the former 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. 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 be using this facility, clean surfaces to the EPA dust-lead standard for young children of 40 $\mu g/ft^2$ on floors and clean to the USACHPPM decontamination level of 200 $\mu g/ft^2$ for dust-lead on all other surfaces.
- 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.
- 2. Additional Recommendations. Address safety hazards posed by air conditioning units and the chain on the drill floor garage.

APPENDIX A

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE ASSESSMENT CRITERIA FOR LEAD

SUBJECT: National Guard Bureau Region North Industrial Hygiene Office Proposed Recommendations for Surface Lead in Armories

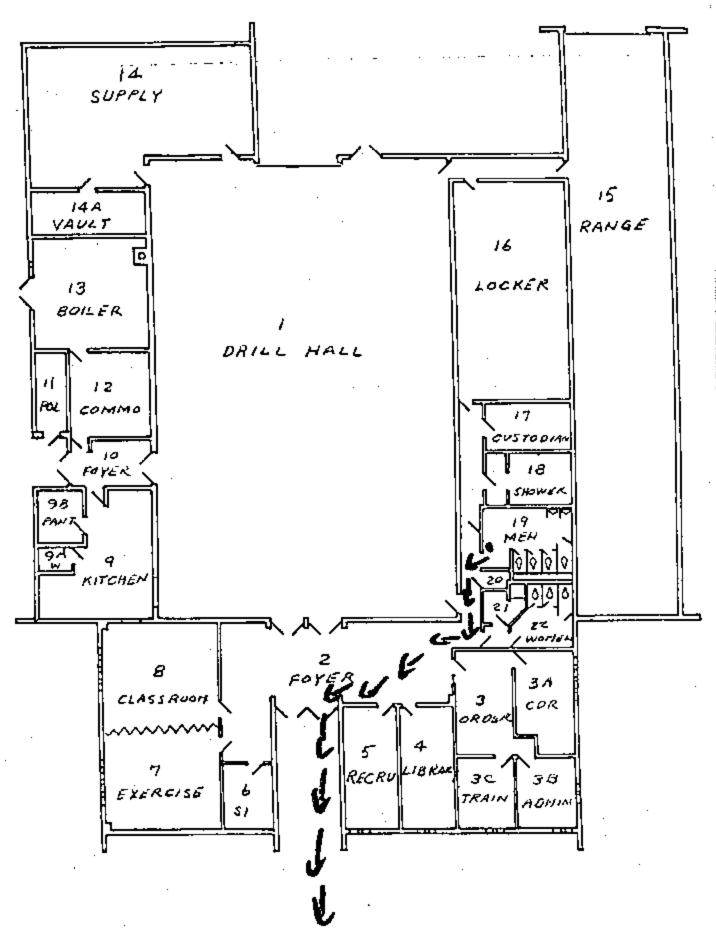
- 1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 μ g/ft². This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.
- a. EPA standards (40 CFR 745.227(e) (8) (viii)) and State of Maryland standards are not directly applicable because they are developed for floors (40 μ g/ft²), windowsills (250 μ g/ft²) and window troughs (400 μ g/ft²) 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 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. OSHA cites a level of $200 \,\mu\text{g/ft}^2$ 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 $50 \,\mu\text{g/m}^3$ 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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MDARNG, MG Henry C. Evans Armory, Westminster, MD Project No. 55-ML-01ED-03/05

APPENDIX B

SITE MAPS



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WESTBAHLAMBATLEGRIPY

A REMARKS Record #J-15-0085 (MD)

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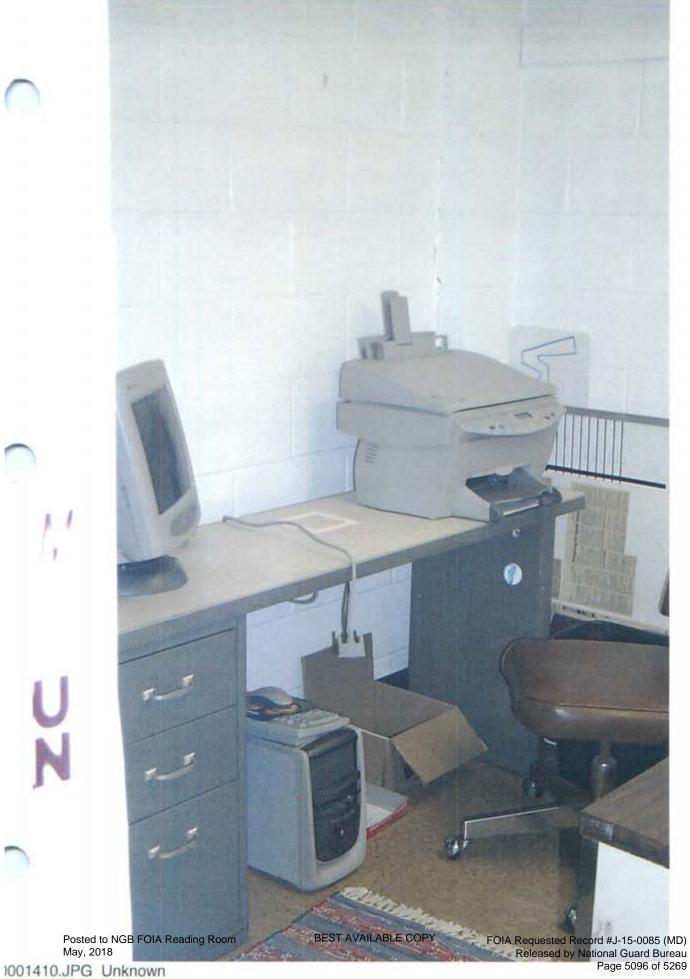
MDARNG, MG Henry C. Evans Armory, Westminster, MD Project No. 55-ML-01ED-03/05

APPENDIX C

PHOTOGRAPHS

Photographs Showing Lead Paint and Wipe Sample Locations

Photo #	Location of Samples				
1410	Recruiters Office desk top (SFC				
1411	Room 3B top of file cabinet				
1412	Bullet trap area of former indoor firing range (IFR)				
1414	One foot from door to IFR				
1415	Onwall about four feet from door in former IFR				
1416	On work bench now in former IFR				



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APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

Westminster Armory Lead Wipe Sample Results

			Indoor Range Info			nfo		
Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (μg/ft²)
			No			Yes		
WRW01	Westminster	Westminster					Recruiters Office desk top (SFC	BDL
WRW02	Westminster	Westminster					Room 3B top of file cabinet	BDL
WRW03	Westminster	Westminster					Bullet trap area of old IFR	1364
WRW04	Westminster	Westminster					One foot from door to IFR	132
WRW05	Westminster	Westminster					Onwall about four feet from door in former IFR	BDL
WRW06	Westminster	Westminster					On work bench now in former IFR	BDL



ted To:

Non-Responsive

Commander, USACHPPM

MCHB TS OFS; 5158 Blackhawk Road

APG, MD 21010-5403

nce Data:

Lead

lient Sample No.:

WRBLANK01 through WRAS02

.O. No.:

Not Available

ample Location:

Westminister

ample Type:

Filter

lethod Reference:

NIOSH 7300 03-S-3734

CL Set ID No.: CL Sample ID No.:

03-22924 through 03-22927

Sample Receipt Date:

8/4/2003

reparation Date:

08/06/03

malysis Date:

08/07/03

The samples were prepared and analyzed in accordance with NIOSH 1 7300 using a Perkin Elmer 3000XL ICP.

The sample condition upon receipt was acceptable except where

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

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Non-Responsive

Non-Responsive

Reviewer

Chris Baugues Analyst

ICINNATI OFFICE 8 GLENDALE-MILFORD ROAD ICINNATI, OHIO 45242-3706 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/m³
WRBLANK01	03-22924	0	ND	
WRBLANK02	03-22925	0	ND	-
WRAS01	03-22926	174.9	ND	<0.006
WRAS02	03-22927	165.2	ND	<0.006
	Prep Blank		ND	
Recovery	LCS		99.	
RPL			1.	

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

Non-Responsive

Chris Baugues Analyst Non-Responsive



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: Project Description:

RES 96187-1 None Given

None Given

Non-Responsive

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 96187-1 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,

Non-Responsive

President

Some State of Great Holding to

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896 A1HA Certificate of Accredidation #480 LAB ID 101533

TABLE

ANALYSIS:

LEAD BY WIPE SAMPLING

RES Job Number:

RES 96187-1

Client:

USACHPPM None Given

Client Project Number / P.O.: Client Project Description:

None Given

Date Samples Received:

August 4, 2003

Analysis Type:

USEPA SW846 3050B / AA(7420)

Turnaround:

3-5 Day

Date Samples Analyzed:

August 11, 2003

Client	Lab	Sample	LEAD	Detection	LEAD	
ID Number	ID Number	Area	(pg)	Limit	CONCENTRATION	
		(sq.fL)		$(\mu g/sq.fl.)$	(µg/sq.fl.)	
CF BLANK01	EM 802204	0.11	BDI.	23	BDL.	
CF W01	EM 802205	0.11	BDL	23	BDJ.	
CF W02	EM 802206	0.11	BDL	23	BDL	
CF W03	EM 802207	0.11	BDL	23	BDL	
CF W04	EM 802208	0.11	BDL	23	BDL	
CF W05	EM 802209	0.11	8.0	23	73	
CF BLANK02	EM 802210	0.11	BDI.	23	BDL	
CF W06	EM 802211	0.11	46.3	23	421	
CF W07	EM 802212	0.11	BDL	23	BDL	
WR BLANKOI	EM 802213	0.11	BDL.	23	BDL	
WR W01	EM 802214	0.11	BDJ.	23	BDL	
WR W02	EM 802215	0.11	BDL	23	BDL	
WR W03	EM 802216	0.11	150.0	23	<u> 1364 </u>	
WR W04	EM 802217	0.11	14.5	23	_132	
WR W05	EM 802218	0.11	BDL	23	BDI.	
WR BLANK02	EM 802219	0.11	BDL	23	BDL	
WR W06	EM 802220	0.11	BDL	23	BDL	
WR W07	EM 802221	0.11		No Sample Submitted In Tube		
EC BLANK01	EM 802222	0.11	BDL	23	BDL	
EC W01	EM 802223	0.11	BDL	23	BDL.	
EC W02	EM 802224	0.11	BDL	23	BDL	
EC W03	- EM 802225	0.11	2.5	23	23	
EC W04	EM 802226	0.11	BDL	23	BDL	
EC W05	EM 802227	0.11	BDL	23	BDL	
EC RLANK02	EM 802228	0.11	BDL	23	BDL	
EC W06	EM 802229	0.11	BDL	23	BDL	
EC W07	EM 802230	0.11	BDL	23	BDL	
EC W08	EM 802231	0.11	BDI.	23	BDL	
GA BLANKOL	EM 802232	0.11	BDL	23	BDJ.	
GA W01	EM 802233	0.11	2.7	23	25	

BDI. = Below Detection Limit

Page 2 of 3

Dala Qa E

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MDARNG, MG Henry C. Evans Armory, Westminster, MD Project No. 55-ML-01ED-03/05

APPENDIX E

REFERENCES

APPENDIX E

REGULATIONS AND STANDARDS

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APPENDIX F

HUD TECHNICAL GUIDELINES FOR THE EVALUATION AND CONTROL OF LEAD-BASED PAINT HAZARDS IN HOUSING, CHAPTER 14: CLEANING





CHAPTER 14: CLEANING

Ste	p-b	by-Step Summary	14–3
I.	Int	troduction	14–5
	A.	Performance Standard	14–5
	B.	Small Dust Particles	14–5
	C.	Difficulties in Cleaning	14–5
		1. Low Clearance Standards	14–5
		2. Worker Inexperience	14–6
		3. High Dust-Producing Methods and/or Inadequate Containment	14–6
		4. Deadlines	14–6
II.	Со	ordination of Cleaning Activities	14–6
	A.	Checklist	14–6
	B.	Equipment Needed for Cleaning	14–6
	C.	Waste Disposal	14–7
III.	Cle	eaning Methods and Procedures	14–7
	A.	Containment	14–7
	B.	Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques	14–7
		1. HEPA Vacuuming	
		2. Wet-Detergent Wash	14–9
		3. The HEPA/Wet Wash/HEPA Cycle	. 14–11
		4. Sealing Floors	
IV.	Or	der of Cleaning Procedures During Lead Hazard Control	. 14–16
	A.	Precleaning Procedures	. 14–16
	B.	Ongoing Cleaning During the Job	. 14–18
	C.	Daily Cleaning Procedures	. 14–18
		1. Large Debris	. 14–18
		2. Small Debris	. 14–18
		3. Exterior Cleaning	. 14–18
		4. Worker Protection Measures	. 14–19
		5. Maintaining Containment	. 14–19



Chapter 14: Cleaning



V.		der of Final Cleaning Procedures After ad Hazard Control	1/ 10
	Α.	Final Cleaning	
		1. Decontamination of Workers, Supplies, and Equipment	14–19
	B.	Preliminary Visual Examination	14-20
	C.	Surface Painting or Sealing of Nonfloor Surfaces	14-20
	D.	Final Inspection	14-20
	E.	Recleaning After Clearance Failure	14-20
VI.	Cle	eaning Cost Considerations	14–21
	A.	Initial Clearance Test Failure Rates	14-21
	B.	Key Factors In Effective Cleaning	14-21
	C.	Special Problems	14–21
VII	. A	ternative Methods	14-22
	Α.	Vacuums	14-22
	R	Trisodium Phosphata and Other Detergents	14_22



Step-by-Step Summary



Cleaning: How To Do It

- 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.
- 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.
- For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
- 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.
- 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.



-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).





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.

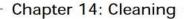
1. Low Clearance Standards

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 μg/ft² on floors.
- 500 μg/ft² on interior window sills (stools).
- 800 µg/ft² on window troughs (the area where the sash sits when closed).
- 800 μg/ft² 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.







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).

Chapter 14: Cleaning



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 triso-dium 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 finedust 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.

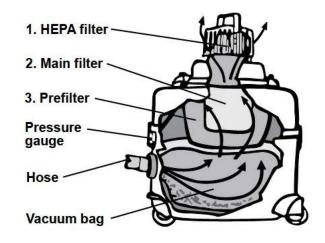
Emptying the HEPA Vacuum

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 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 highphosphate 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



Pressure gauge

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 wetwash 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. EMERGENCY EYE WASH STATION

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).

Latex

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

Neoprene

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.

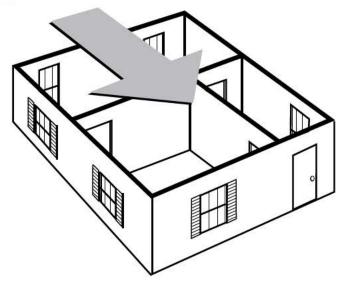
Nitrile



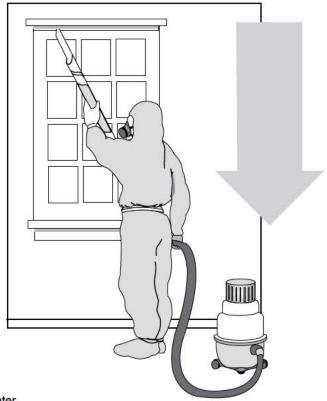


Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

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



Chapter 14: Cleaning



- 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

Chapter 14: Cleaning



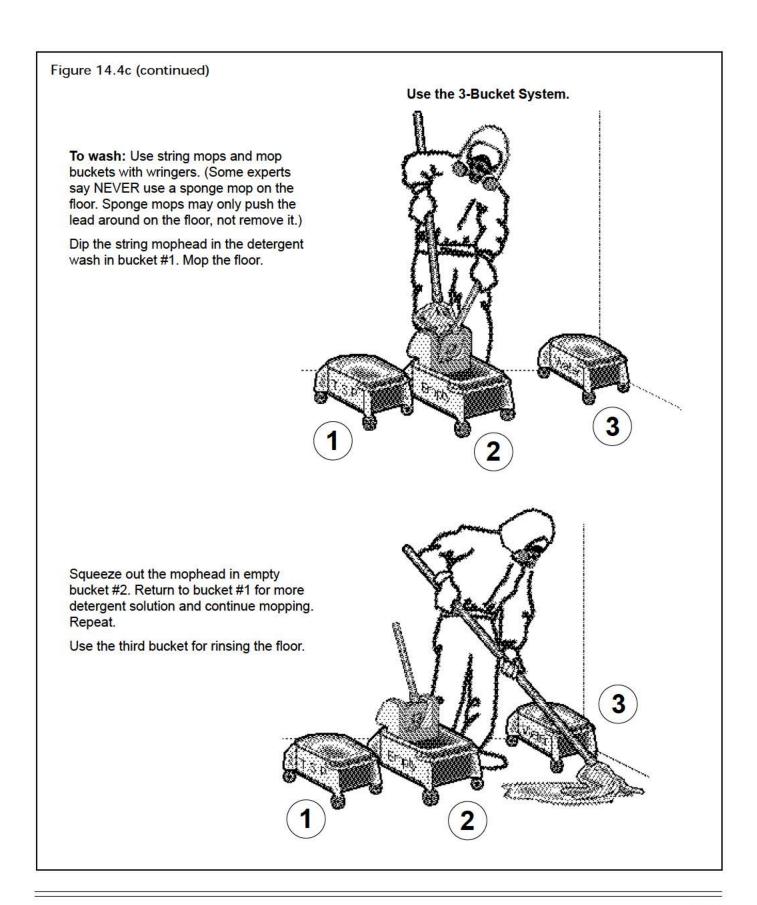


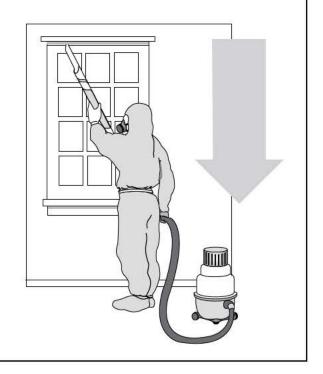




Figure 14.4d (continued)

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.

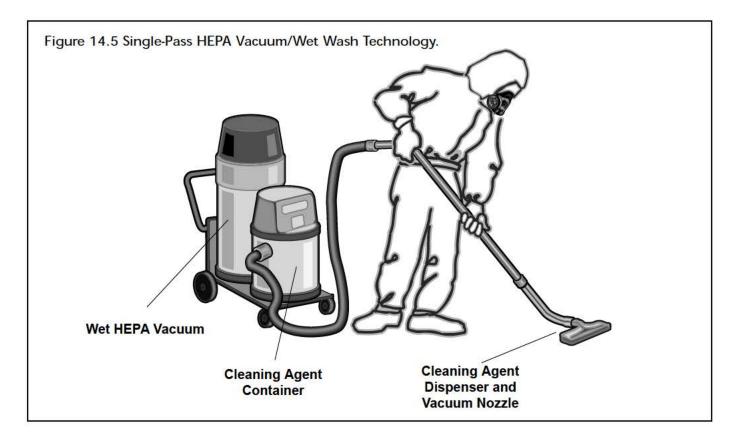
IV. Order of Cleaning Procedures During Lead Hazard Control

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





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



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

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



Chapter 14: Cleaning



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 dustretaining 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)



Chapter 14: Cleaning



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

	Mass Removal Efficiency Percentages Cleaning Method					
Cycle Number						
	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

MDARNG, MG Henry C. Evans Armory, Westminster, MD Project No. 55-ML-01ED-03/05

APPENDIX G

MOLD GUIDANCE

Army Facilities Management Information Document on Mold Remediation Issues

TG 277 FEBRUARY 2002



ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

INTRODUCTION	2
MOLD PREVENTION TIPS	3
REMEDIATION PLANNING	3
REMEDIATE MOISTURE AND MOLD PROBLEMS	3
REMEDIATION PROCEDURES	4
FOUR REMEDIATION LEVELS	4
HAZARD COMMUNICATION	9
CONCLUSION	10
REFERENCES	10
APPENDIX A: WATER DAMAGE CLEANUP AND MOLD PREVENTION	11
APPENDIX B: MOLD REMEDIATION GUIDELINES	14
APPENDIX C: PERSONAL PROTECTIVE GUIDANCE	17
APPENDIX D: CONTAINMENT GUIDANCE	19

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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.

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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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Feb 02

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 ft²) follow Level I guidance for PPE and containment and for a areas (>10 ft²) follow Medium (Level II) or when greater than 100 ft² 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.

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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).

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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

TG 277

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.
- 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.		

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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 (ft ²)				
Books and papers	3			
Carpet and backing	1, 3			
Concrete or cinder block	1, 3	Minimum N-95 respirator, gloves, and goggles		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3			
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		None required	
Upholstered furniture & drapes	1, 3			
Wallboard (drywall and gypsum board)	3			
Wood surfaces	1, 2, 3			

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MEDIUM - Total Surface Area Affected Between 10 and 100 ft ²					
Books and papers	3				
Carpet and backing	1,3,4				
Concrete or cinder block	1,3		Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	Limited or Full Use professional judgment, consider			
Non-porous, hard surfaces (plastics, metals)	1,2,3	potential for remediator exposure and size of contaminated area			
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				
Carpet and backing	1,3,4				
Concrete or cinder block	1,3	Full	Full		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider potential for remediator/occupant exposure	Use professional judgment, consider potential for remediator exposure and		
Non-porous, hard surfaces (plastics, metals)	1,2,3	and size of contaminated area	size of contaminated area		
Upholstered furniture & drapes	1,2,4				
Wallboard (drywall and gypsum board)	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.

Wood surfaces

1,2,3,4

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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.

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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 (ft²) 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 ft² 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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TG 277

February 2002

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278 February 2002



Table of Contents

Introduction	2
Safety Tips While Investigating And Evaluating Mold And Moisture Problems	s 2
Communicate With Building Occupants At All Stages Of Process, As Appropr	iate 3
Routine Investigation And Evaluation Of Moisture And Mold Problems	3
Assessments Requiring Sampling	3
References	4
APPENDIX A: Mold Investigation Decision Logic	5
APPENDIX B: Mold Remediation Guidelines	8
APPENDIX C: Personal Protective Equipment	11
APPENDIY D. Containment Guidance	13

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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 contamination².

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

- 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 appropriate¹.

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 problems³.

- 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 contamination².

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 air⁴. 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 Control⁴."

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.

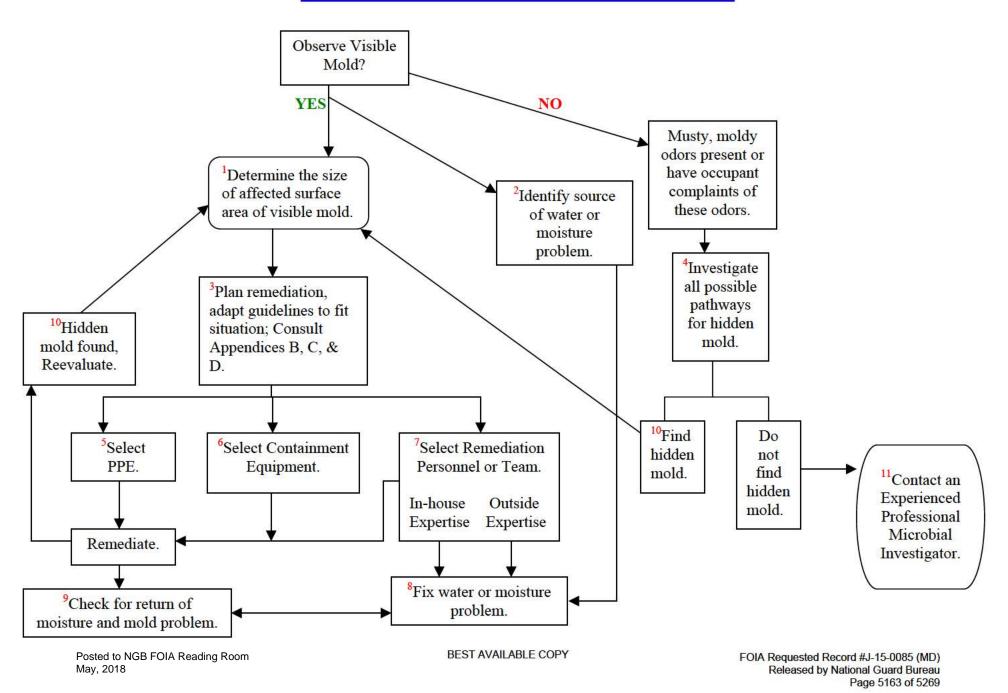
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- 2. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.
- 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



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 activities³. 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.

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment		
	SMALL - Total	Surface Area Affected Less Than 10 squar	re feet (ft ²)		
Books and papers	3				
Carpet and backing	1, 3				
Concrete or cinder block	1, 3	_			
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3	Minimum			
Non-porous, hard surfaces (plastics, metals)	1, 2, 3	N-95 respirator, gloves, and goggles	None required		
Upholstered furniture & drapes	1, 3				
Wallboard (drywall and gypsum board)	3				
Wood surfaces	1, 2, 3				
	MEDIUM - T	otal Surface Area Affected Between 10 and	1 100 ft ²		
Books and papers	3	_			
Carpet and backing	1,3,4	_			
Concrete or cinder block	1,3	Limited on Full	** ** 1		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	Limited or Full Use professional judgment, consider	Limited Use professional judgment, consider		
Non-porous, hard surfaces (plastics, metals)	1,2,3	potential for remediator exposure and size of contaminated area	potential for remediator/occupant exposure and size of contaminated a		
Upholstered furniture & drapes	1,3,4				
Wallboard (drywall and gypsum board)	3,4				
Wood surfaces	1,2,3				
		face Area Affected Greater Than 100 ft ² or diator Exposure During Remediation Esti			
Books and papers	3				
Carpet and backing	1,3,4				
Concrete or cinder block	1,3	Full	Full		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider potential for remediator/occupant exposure	Use professional judgment, consider potential for remediator exposure and si		
Non-porous, hard surfaces (plastics, metals)	1,2,3	and size of contaminated area	of contaminated area		
Upholstered furniture & drapes	1,2,4				
Wallboard (drywall and gypsum board)	3,4				
	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 (ft²) 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 ft² 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 Study

National Guard Facility
Westminster Armory
350 Hahn Road
Westminster, Maryland
21157-4699

Prepared for:

National Guard Bureau Region North IH Office 301-IH Old Bay Lane Havre de Grace, Maryland 21078

Prepared by:

The El Group, Inc. 2101 Gateway Centre Blvd. Morrisville, North Carolina 27560

Report Date: December 30, 2008

Project ID: IHMO080101.03



Manager, Charlotte Operations



Senior Industrial Hygienist

TABLE OF CONTENTS

Executive Summary	3
Operation Description	4
Noise	4
Lead Testing	4
Lighting	5
Indoor Air Quality	6
Suspect ACBM	7
Maintenance Bay	7
Ventilation Assessment	8
Limitations	8
References	8

List of Appendices

Appendix A: Photographs

Appendix B: Laboratory Analysis Report

EXECUTIVE SUMMARY

An industrial hygiene survey was conducted August 6, 2008 at the Armory located in Westminster, Maryland. The study was performed by Mr. Non-Responsive, 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. Lead contamination was identified in the old firing range HVAC system, floor as well as the inside cover of the fan coil unit located in Office 5.

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 Airconditioning Engineers, Inc. (ASHRAE).

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.

Operation Description

The Westminster Armory primarily serves as an office setting and equipment storage facility. The facility consists of a single story plus basement response center that contains office spaces, decommissioned gun range, and 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 pitched metal shingle. The heating, ventilating, and air conditioning system (HVAC) consisted of individual fan coil units in offices as well as a split direct-expansion (DX) system on the drill floor. The floors were composed of a poured concrete slab and in some areas were finished with 12"x12" 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 5 administrative 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 a converted garage which was once an indoor firing range.

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 WipeTM 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.

Lead Testing Results Summary

Location	Air ug/m³	Surface ug/ft²	Bulk	Chip %Pb
516-1: Garage/Firing Range	<2.8			
516-2: Office 3	<3.1			
516-3: Air Blank	<3			
516-4: Garage/Range Floor		400		
516-5: Garage/Range Supply		1,600		
516-6: Kitchen Fridge Top		<110		
516-7: Garage/Stairwell		290		
516-8: Office 3 Shelf		<110		
516-9: Office 5 HVAC		230		
516-10: Wipe Blank		<12		
Criteria	50	200	5,000	0.5

Key: ND - None Detected

PB - Lead

No deteriorated paint was observed in the facility. Surface lead was detected in the supply duct of the garage/firing range, garage floor, and stairwell to garage and inside cover of the fan coil unit located in office 5 (Supply side of unit ventilator). The National Guard Bureau currently utilizes 200 ug/ft² 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/ft² is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, HUD levels of 40 $\mu g/ft^2$ on floors and 250 $\mu g/ft^2$ 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/m³.

<u>Lighting</u>

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
Classroom 7/8	51-63	30-50	Yes
Foyer	29-36	10	Yes
Office 5	72-130	30-50	Yes
Office 4	73-119	30-50	Yes
Office 3	47-72	30-50	Yes
Kitchen	38-51	50	Yes
Supply Room	27-46	30	Yes
Drill Floor	19-37	30-50	Yes
Women's Latrine	25-36	5	Yes
Men's Latrine	32-54	5	Yes
Rear Hallway	19-26	5	Yes
Bunk Room	37-48	30-50	Yes
Locker/Gym	25-37	7 / 30	Yes
Garage/Former Range	18-43	75	NO

Lighting was found to be sufficient in all areas with the exception of the Garage/Storage Room which was formerly the indoor firing range.

Indoor Air Quality

Posted to NGB FOIA Reading Room

May, 2018

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 Fluke IAQ Meter, Model 975. The IAQ Meter was last calibrated in April 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 55-2007). The US Army Technical Guide 277, Army Facilities Management Information Document on Mold Remediation Issues, 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 68.9 to 79.7 °F with relative humidity readings ranging from 49.7 to 56.9%. During the survey, CO₂ levels ranged from 503ppm to 582ppm.

Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO₂ recommended is 1,091 ppm (391 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)
Classroom 7/8	68.9	56.9	507	0
Front Foyer	72.5	56.2	512	0
Room 5 Recruiting	74.3	54.7	578	0
Room 4 RNCO	74.2	54.4	582	0
Room 3 Orderly	76.1	54.8	555	0
Kitchen	76.1	51.2	503	0
Supply Room	77.9	52.2	567	0
Drill Floor	78.1	50.3	545	0
Women's Latrine	77.9	49.7	542	0
Men's Latrine	77.7	51.1	531	0
Bunk Room	78.8	48.7	557	0
Rear Hallway	78.8	49.2	509	0
Locker Room/Gym	78.6	48.6	551	0
Garage/IFR	79.7	51.3	508	0
Outdoors	81.3	58.2	391	0
Criteria	73.0-79.0	30-50	<1,091	<9.0

Limited fungal growth was identified on the TSI located in the supply room.

The fan coil unit located in Classroom 8 was overheating at the time of the assessment. The unit was being run with the cover off with a fan forcing air over the control unit.

Water damaged ceiling tiles were identified in Offices 4, 5 and 8 as well as in the kitchen.

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.

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.

PPE identified in the site included safety glasses and chemical gloves. Materials were kept in good, clean condition.

Two electrical panels were found to have less than three feet of working clearance as well as containing an unsecured compressed gas cylinder.

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 individual fan coil units along the perimeter wall which provided heating and cooling. The supply vent in office 5 was found to contain detectable levels of lead. The fan coil unit in the classroom was found to have an electrical short in the motor causing it to overheat. Site personnel removed the cover of the unit and used an additional fan to cool the motor.

No LEV system was present in the garage/storage room; however an HVAC system was installed for comfort parameters. The LEV system located in the garage was not operable at the time of the assessment.

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 El Group, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

<u>References</u>

May, 2018

Posted to NGB FOIA Reading Room

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.

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

Posted to NGB FOIA Reading Room

May, 2018

Appendix A

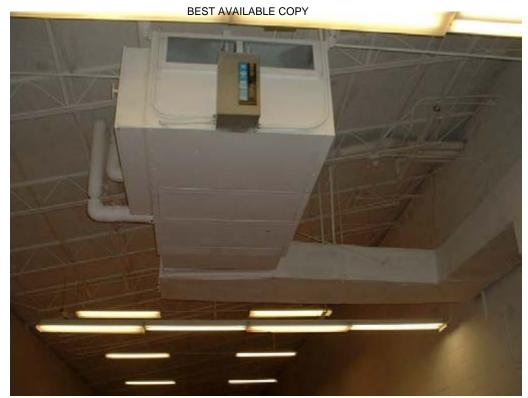
Photographs



Exterior view of facility



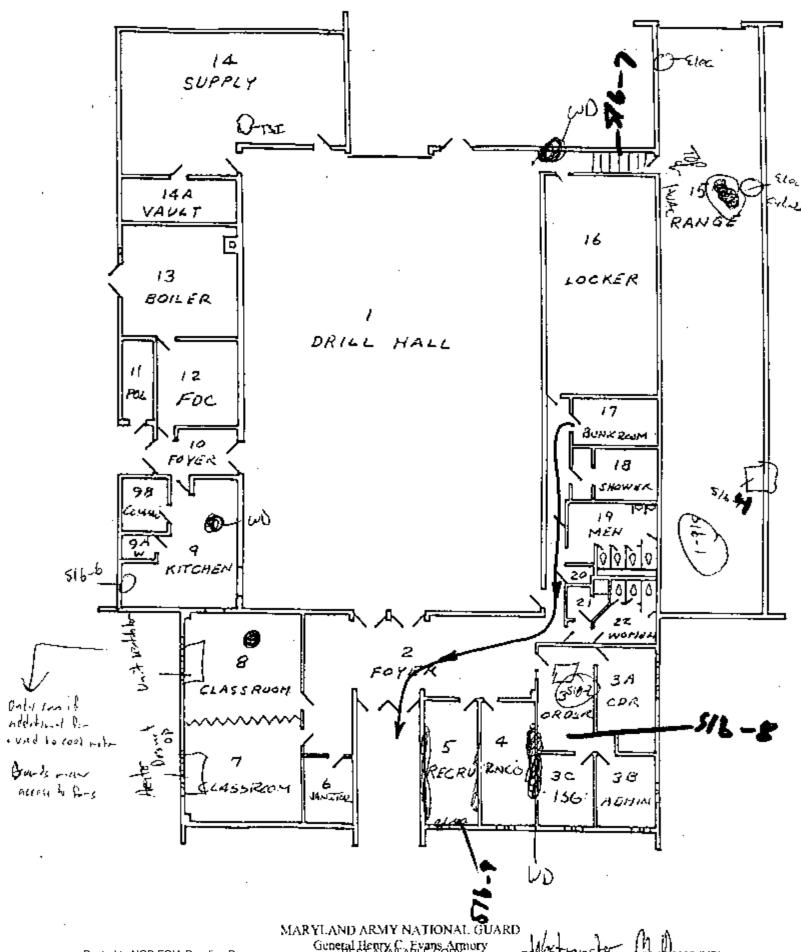
Water damaged ceiling panel in Office 5



Mechanical system in Garage



Fan coil unit located in Class 8.



Posted to NGB FOIA Reading Room May, 2018

FOIN Requested Record #J-15-0085 (MD)
Released by National Guard Bureau
Page 5185 of 5269

Appendix B

Laboratory Analysis Report





AMA Analytical Services, Inc.



Invoice:

95255

Client:

National Guard Bureau

Job Name:

RC 516 Westminster, MD

Chain Of Custody:

181398

Address:

301-IH Old Bay Lane, Attn:

Job Location:

Not Provided

Date Submitted:

9/4/2008

NGB-AVN-SI

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:

Non-Responsive

Attention:

Non-Responsive

Page 1 of I

AMA Sample #	Client Sample #	Analysis and Sample Type	Turn Around	Cost	Additional Analysis and Sample Type *	Turn Around *	Additional Cost *	Total Cost
0881913	516-1	AA Lead Air	5 Day +	\$8.00				\$8.00
0881914	516-2	AA Lead Air	5 Day +	\$8.00				\$8.00
0881915	516-3	AA Lead Air	5 Day +	\$8.00				\$8.00
0881916	516-4	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0881917	516-5	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0881918	516-6	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0881919	516-7	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0881920	516-8	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0881921	516-9	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0881922	516-10	AA Lead Wipe	5 Day +	\$8.00				\$8.00

Sub-Total:

\$80.00

Additional Charge:

\$0.00

Total:

\$80.00

Note: Payment Due Upon Receipt.

Note: All Accounts over 30 days are subject to a 11/2% per month service charge.

* Only apply if additional analysis was performed on the sample(s)

Account Code:

NATLG

AMA Analytical Services, Inc.

CERTIFICATE OF ANALYSIS

A Specialized Environmental Laboratory

Address: Client: \$ 30 ž

	Havre de Grace, Maryland 21078	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	National Guard Bureau
P.O. Number:	Job Number:	Job Location:	Job Name:
Not Provided	Not Provided	Not Provided	RC 516 Westminster, MD
Date Analyzed:	Person Submitting:	Date Submitted:	Chain Of Custody:
9/9/2008	Non-Res	9/4/2008	181398

Summary of Atomic Absorption Analysis for Lead

Attention:

B 2	B	E	ST	AV.A Se	AILA &	\BL	E C ௐ	OPY ©	AMA
0881021	81920	81919	0881918	81917	81916	81915	81914	0881913	AMA Sample Number
516-9	516-8	516-7	516-6	516-5	516-4	516-3	516-2	516-1	Client Sample Number
Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Analysis Type
Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Air Blank	Air	Air	Sample Type
**	***	* * * * * * * * * * * * * * * * * * *	***	* * *	*	0	968	1056	Air Volume (L)
0.108	0.108	0.108	0.108	0.108	0.108	N/A	N/A	N/A	Area Wiped (ft²)
111.52	111.52	111.52	111.52	111.52	111.52	3.00	3.10	2.84	Rep
ug/ft²	ug/ft²	ug/ft²	ug/ft²	ug/fi²	ug/ft²	ug/m³	ug/m³	ug/m³	Reporting Limit
	۸		٨			٨	٨	^	:
230	011	290	110	1600	400	نيا	3.1	2.8	Final Result
ug/ft²	ug/ft²	ug/ft²	ug/fì²	ug/ft²	ug/ft²	β'n	ng/m³	ng/m³	
									Comments
		BE	ST	AVA	\ILA	NBL	ΕC	OPY	F

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 chients, the public, and these Laboratories, this report and accepted for the exclusive use of the client to whom it is addressed and upon the candition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written undividuals ample material will be information provided by the presents submitting them and, unless collected by personnel of these Laboratories, we expressly discious material will be discarded in accordance with the appropriate regulatory guidelines, nature, subtervise explosed discious material will be discarded in accordance with the appropriate regulatory guidelines, nature, subtervise expressly discious material will be first accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and completely applies only on polarized injulity for the accuracy and only on the accuracy and only on the accuracy and only on the accuracy and only only on the accuracy and only on the accuracy and on

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FOIA Requested Record #J-10085 (MD)
Released by National Guard Bureau
Page 5188 of 5269

Report Date:

%Pb = percent lead by weight N/A = Not Applicable

ug = micrograms

should not be considered when interpreting the result.

Note: All results have two significant digits. Any additional digits shown Note: All samples were received in good condition unless otherwise noted

Air and Wipe results are not corrected for any blank results

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7421; Water: SM-3113B Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water. SM-3111B

mg/kg = parts per million (ppm) by weight mg/L = parts per million (ppm)

ug/L = parts per billion (ppb)

samples.

associated with these sampes.

AMA Analytical Services, Inc. A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCARDITED LA

Client: National Guard Bureau

Job Name: Chain Of Custody:

Address: Attention: State Military Reservation 301-IH Old Bay Lane, Attn: NGB-AVN-SI, Havre de Grace, Maryland 21078

> Job Location: Not Provided

P.O. Number: Job Number:

Not Provided Not Provided RC 516 Westminster, MD

Date Submitted:

9/4/2008 181398

Page 5189 of

Person Submitting

Date Analyzed:

9/9/2008

Report Date:

FOIA Requested Record #J Foo85 (MD)
Released by National Guard Bureau
Page 5189 of 5269

Comments

Summary of Atomic Absorption Analysis for Lead

Air Volume

AMA Sample

Client Sample

Analysis Type

Sample Type

Number

Area Wiped

Reporting Limit

Final Result

NY ELAP accrediation applies only to paint chip, wipe, and wate See QC Summary for analytical results of quality control samples

ABLE COPY

Analyst:

Technical Manager:

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 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 completenessly 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 insulv products or and accounted as and accounted to the client.

NGB FOIA Reading Room

An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory



AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 16542

Analysis Type:

E lame

Sample Type:

Analysis Date:

9/8/2008

	Re	Result		RPD	Comment	
Preparation Blank	0.010	ताबृ व्			Acceptable	
Report Limit Verification Sample	0.2686	ppm	107 4%		Acceptable	
Expected Spike Level (ppm) 0.25						
Duplicate Sample 1	»Num!	mg/Kg				
Dupticate Sample 2	≠Num'	mg/Kg		Alteror	#Hirtor	
Matrix Spike Analysis						
Spiked Sample			102,73%		Acceptable	
Spike Duplicate			99 56%	3 (4%	Acceptable	
Laboratory Control Sample 1	133 956	μg	103 29%		Acceptable	
Laboratory Control Sample 2	120 145	μB	100.16%	3.07%	Acceptable	

Calibration Information

0.499875 Carrelation of Calibration Curve.

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

81734

AMA Sample Number Client Sample Number Chain Of Custody 81732 182853

182853

84681 840#3

16542 SDG Number:

Page 1 of 2

Samples included in this Sample Delivery Group (SDG)

Chain Of Custady	AMA Sample Number	Client Sample Number
182853	B173B	84087
182853	81739	84088
503162	\$1781	OUN-I A-01
503162	81782	OLN-LA-FB1
503158	81797	HLN-I.A-01
503158	81798	HUN-LA-FB1
\$03165	81852	JTN-LA-01
503165	H1853	JTN-LA-FB1
181396	¥1K72	1
181396	81873	2
181396	81874	3
18139£	81913	516-1
181398	81914	516-2
181348	81915	516-3
181399	81923	\$00-1
181394	81924	500-2
181399	81925	500-3

SDG Number: 10542 Page 2 of 2





QC Summary

Sample Delivery Group: 16549

Analysis Type: Flame
Sample Type. Wipe
Analysis Date: 9/9/2008

	Analysu	s Dete:	9/9/2008		
	Ř	cşuli	Percent Recovery	RPD	Comment
Preparation Black	-0,052	ppm			Acceptable
Report Limit Verification Sample	0.2705	ppm	81.2%		Acceptable
Expected Spike Level (ppm) 0.3333					
Duplicate Sample 1	¢Num:	mg/Kg			
Duplicate Sample 2	₹Num!	mg/Kg		#Ecros	#Error
Matrix Spike Analysis					
Spiked Sample			95.13%		Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample 1	315,233	μg	102.83%		Acceptable
Laboratory Control Sample 2	304,974	μ я	102 95%	0.11%	Acceptable

Calibration Information

Correlation of Calibration Curve 0 999908

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
 81902
 486-4

 181397
 81903
 486-5

SDG Number: 16549 Page Lof 2

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181397	81904	486-6
181397	81905	486-7
181397	81906	486-B
181397	81907	486-9
181397	81908	486-10
181398	81916	\$16-4
181398	81917	516-5
181398	81918	516-6
181398	81616	516-7
181398	81920	516-8
181398	81921	516-9
181398	81922	516-10

SDG Number: 16549 Page 2 of 2



SAMPLE CHAIN OF CUSTODY

DATÉ SHIPPED # OF SA	MPLES		SAMPLE MEDIA T	YPE P	ROJECT NAME
DATE SHIPPED # OF S/	10	* - ₹		#	96/181398
CONTACT				TELEPHON	E NUMBER
					and the second s
SAMPLE # OR AREA	SA D	MPLE ATE	SAMPLE VOLUME	ANAL	YSIS REQUESTED
516-1	8/6/	08	1056.02	bod.	A:_
516-2			967.88		www.mananananananananananananananananananan
516-3		<u> </u>	Ø	V	
516-4 (Russ Ar)			100 cm2	Lead	Uje
516-5 (Rays HUAK)			1000	. (a Mariana a	
516-6 (At Ria)			100cm		
516-7 (stain Fir Ra	.)	<u></u>	. 100cm		
516-6 (R-3 alele)			100002		
516-5 (R-5 ACAST)	1,	10000		
516-10 (Blank)		V	ø		<u> </u>
- A MANAGEMENT OF THE PROPERTY					
				**	
		Non-Re	esponsive		
Samples Relinquished	i By:				8/19/08 Date
Samples Received I	Зу:	Signatu	ia .		/ Date
Samples Analyzed E	Зу:				Date
		Signatu	II.S.		CEVE

Wastminster

BEST AVAILABLE COPY PLM Bulk Cl EPA 600 - Visual Estimate Cl EPA 600 - Visual Estimate Cl EPA Foint Count Cl NY State Friable 198.1 Cl Grav. Reduction ELAP 198.6 Cl Other (specify Malling/Billing Information: 1. Client Name: 1 24 Hours CM Air - Please Indicate Filter Type: EMAir - Please Indicate Filter Type: strestos Analysis Immediate Client Name: Phone # 336 455 Address 3 Address 2: Address I: AHERA. O Fiberglass PC MCE Porosity_ UNIOSH 7400. PC MCE Porosity J NIOSH 7402. 4475 Forbes Blvd. • Lanbam, MD 20706 (301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643 AMA Analytical Services, Inc. www.amaleb.com AIHA (#100470) NVLAP (#101143-6) NY ELAP (10920) STAFF ONLY: LABORATORY ACTER HOURS (must be pre-scheduled) Focused on Results CLIENT ID (CUSTODY) Time Due: Date Due: 301-14 Ŧ. SAMPLE INFORMATION SAMPLE LOCATION (SIS) in a 25mm 37mm 8552 (STS) 3. Results Reported To: N L(QTY) 25000 Date/Time RCVD: Date/Time Analyzed: CYTES). (FUXING 378000 1 (ZTS) F (QT3) 93 . 273 DATE Fex # 764 543 30 312 C 2 Day O Next Day **YOLUME** LITERS Reporting Information (Results will be provided as soon as technically feasible): NORMAL BUSINESS BIQUES TEM Dass J Qual. (pres/abs) Vacuum/Dast Quan. (s/area) Vacuum/Dast Quan. (s/area) Dast D6480-99...... Ü 2/078 AREA IEM Water - Qual (presiats) EM Bulk DELAP 198.4/Owfield DNY State PLM/TEM DRosidual Ash ☐ All samples received in good condition unless otherwise noted. ☐ ELAP 198.2/EPA 100.2 ☐ EPA 100.1 TEM Water samples 1650 CHAIN OF CUSTODY Date Due: B TEM @227 7229 SISXIVAN SISXIVAN (5) Submittal Information: ¥ia. Job Name: By Profit Submitted by: [ob.# Contact Person LUALI Job Location: Q13 ₫ Results Required By Noon (EveryAntempt Will Be 93 STS. MOLD ¥. . (VTQ). Made to Accomodate) AIR (QT 5) RULR . 2 3 95 By (Print) MATRIX B. J. J. Date; SPORT TRAP Mold - Direct Microscopic Analysis D rinking Water (QTY) D Drinking Water (QTY) D Whate Water (QTY) lead Analysis Mary water D Include Ernail Dust Wipe (wipe type | QT) Air (QT) O Soil/Solid TAPE Paint Chip. P.O. # SWAR Number For Inquires) (Please Refer To This S.gnatare: Sign Date/Time DateCline Date/Time ٩ CTD (QTY) D Bulk (QTY) (QTY) Surface Vacoum Dust Hodd (QTY) Cl Other (Specify... Time: LABORATORY STAFF ONLY REPORT TO: (CTY) CLIENT CONTACT (QTY) Sign Contact Contact Contact toutials: (QTS) By By Вy

OTY)

National Guard Region North

National Guard Readiness Center Industrial Hygiene Evaluation Westminster Army National Guard Armory Westminster, MD 21157-4699

Prepared for:

National Guard Region North Industrial Hygiene Office 301 Old Bay Lane Havre De Grace, MD 21078

Attn:

Non-Responsive

Prepared by:

Bonus Environmental, LLC P.O. Box 121 Mt. Pleasant, Michigan 48804

> Project No. 1061-03 August 21, 2010

Bonus Environmental, LLC

TABLE OF CONTENTS

1.	EXE	CCUTIVE SUMMARY	Ì
2.	<i>LEA</i>	D SAMPLING	2
	2.1	Lead Wipe Sampling	2
	2.2	Lead Air Sampling	2
3.	PHY	SICAL CONDITION OF FACILITY / PERSONNEL CONCERS	ŝ
	3.1	Lead Based Paint	Ĵ
	3.2	Presumed Asbestos Containing Materials	4
	3.3	Water Damage/Mold Growth	4
	3.4	Housekeeping	4
	3.5	Employee Interviews	4
	3.6	Indoor Air Quality	4
4.	LIG	HTING SURVEY	ć
5.	COI	NCLUSION	7

APPENDICES

Appendix A Shop Diagram

Appendix B Lead Sample Results

Appendix C Photographs

Appendix D References



August 21, 2010 Project No. 1061-03

National Guard Region North Industrial Hygiene Office 301 Old Bay Lane Havre De Grace, MD 21078-4003

Attn: Non-Responsive

Project: Army National Guard Readiness Center, Industrial Hygiene Evaluation

Westminster 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 Westminster Army National Guard Readiness Center located at 350 Hahn Road in Westminster, 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 Non-Responsive on May 21, 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 Westminster Readiness Center is an Army National Guard armory comprised of offices, a drill hall, a kitchen, a fitness room, a boiler room, and a former indoor firing range. There is no current point of contact for this facility, as it is currently used by only two (2) recruiters and a caretaker. Therefore, no full-time administrative or maintenance personnel are employed in the approximately 19,530 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



August 21, 2010 Page 2

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). Sixteen (16) 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 following table outlines the locations and analytical results for the lead wipe samples collected during this project

	Army National Guard – Westminster Readiness Center					
	Lead Wipe Sample Results					
Sample #	Sample Date	Sample Location	Sample Area (ft²)	Sample Result (µg/ft²)		
W-W-1	5-21-10	Field Blank		< 12		
W-W-2	5-21-10	Drill hall, SW corner, top of Master Control Panel box	0.111	220		
W-W-3	5-21-10	Drill hall, NE corner, top of fire extinguisher housing	0.111	< 110		
W-W-4	5-21-10	Drill hall, north wall, top ledge of chalkboard	0.111	230		
W-W-5	5-21-10	Drill hall, floor, east end "free throw" line	0.111	< 110		
W-W-6	5-21-10	Drill hall, floor, west end "free throw" line	0.111	< 110		
W-W-7	5-21-10	Kitchen, top of stove hood	0.111	< 110		
W-W-8	5-21-10	Room 15, former indoor firing range, exhaust ventilation duct	0.111	1300		
W-W-9	5-21-10	Room 15, former indoor firing range, center of room, light fixture	0.111	840		
W-W-10	5-21-10	Room 15, former indoor firing range, floor, center of room	0.111	< 110		
W-W-11	5-21-10	Room 15, former indoor firing range, south side of room, top of locker	0.111	< 110		
W-W-12	5-21-10	Stairway handrail, north of room 15	0.111	< 110		
W-W-13	5-21-10	Room 7/8, west side, Internet Access Point keyboard	0.111	< 110		
W-W-14	5-21-10	Room #2, foyer, east wall, top of drinking fountain	0.111	< 110		
W-W-15	5-21-10	Room 3B, surface of office desk	0.111	< 110		
W-W-16	5-21-10	Room #16, top of exercise machine	0.111	< 110		
W-W-17	5-21-10	Room #13, boiler room, top of water heater	0.111	760		

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



August 21, 2010 Page 3

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 – Westminster Readiness Center Lead Air Sample Results								
Sample #	Sample Type	Sample Location	Flow Rate	Start	Stop	Vol.	Rpt. Limit (μg/m³)	Results (μg/m³)	8 hr TWA (μg/m³)
May 21,	2010								
W-A-1	FB	Field Blank				0	3	< 3	N/A
W-A-2	IWA	Room 3, during daily activities	2.0	0915	1513	716	4.2	< 4.2	N/A
W-A-3	IWA	Room 15, former indoor firing range	2.0	0916	1514	716	4.2	< 4.2	N/A

PS = Personal sample, **IWA** = Inside work area, **N/A** = Not Applicable **Note**: The OSHA PEL of $50 \mu g/m^3$ 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 Westminster 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 north wall of room 9 (Kitchen). One (1) bulk sample paint chip was collected from the north wall of room 9 (Kitchen). 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 did not contain detectable levels of lead. The



August 21, 2010 Page 4

paint is therefore not considered to be lead-based paint. Analytical results are attached to this report as Appendix B.

3.2 – Presumed Asbestos Containing Materials

During the industrial hygiene evaluation of the Army National Guard Westminster 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, with the exception of minor localized damage to presumed asbestos containing 12" x 12" floor tile located in room 15.

3.3 - Water Damage/Mold Growth

During the industrial hygiene evaluation of the Army National Guard Westminster 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. Water-stained ceiling materials were noted in room 7/8, room 9 (kitchen), room 13 (boiler room), and at the top of the stairway leading down to room 15. No active fungal growth was seen.

3.4 - Housekeeping

During the industrial hygiene evaluation of the Army National Guard Westminster 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 Westminster Readiness Center, Bonus Environmental, LLC performed interviews and made observations to determine if the work activities being performed possessed any 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 Westminster Readiness Center, Bonus Environmental, LLC measured temperature, relative humidity, carbon monoxide (CO), and carbon dioxide (CO₂) 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 CO₂ 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 CO₂ concentrations can be found near vehicle traffic areas, industry and sources of combustion. The concentrations of CO₂ 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 CO₂ 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



NGB / Westminster Army National Guard Readiness Center Project No. 1061-03 August 21, 2010 Page 5

ASHRAE Standard 62.1-2007, CO₂ concentrations below 700 ppm above the outdoor level are considered to indicate adequate ventilation and provide human comfort. The CO₂ measurements collected during this industrial hygiene evaluation ranged from 416 ppm to 558 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 0.6 ppm to 2.1 ppm. CO levels were well below the OSHA PEL during this industrial hygiene evaluation.

During the industrial hygiene evaluation of the Army National Guard Westminster Readiness Center, Bonus Environmental, LLC collected temperature measurements. Temperature measurements throughout the facility ranged from 70.8°F to 76.4°F and are considered to be within an acceptable range.

During the industrial hygiene evaluation of the Army National Guard Westminster Readiness Center, Bonus Environmental, LLC collected relative humidity measurements. Relative humidity measurements throughout the facility ranged from 46.1% to 58.5% 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.



August 21, 2010 Page 6

Army National Guard – Westminster Readiness Center Indoor Air Quality Measurements					
Location	CO_2	CO	Relative	Temperature	
Location	(ppm)	(ppm)	Humidity (%)	(°F)	
Outdoors, north side of building	391	2.1	46.9	75.5	
Room 9 (Kitchen)	516	2.1	46.1	76.4	
Room 7/8	533	1.9	47.0	75.1	
Room 3	521	1.5	47.3	74.2	
Room 19	509	1.5	49.4	73.2	
Room 16	482	1.5	50.2	72.6	
Room 15, west end	416	1.6	58.5	70.8	
Room 1 (Drill hall), center of room	506	1.4	54.1	71.0	
Room 13 (Boiler room)	558	0.6	50.8	77.4	

Required/Recommended Values

CO₂ - 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 – Westminster Readiness Center Lighting Survey						
Location	Measurement in Foot Candles	Requirement in Foot Candles	Requirement Met?			
Room 7/8 – Classroom	81.7	30	YES			
Room 6 – Caretaker's storage	74.2	30	YES			
Room 2 – Foyer	50.2	5	YES			
Room 5 – Office	65.9	50	YES			
Room 4 – Office	51.8	50	YES			
Room 3 – Office	71.7	50	YES			
Room 3A – Office	67.4	50	YES			
Room 3B – Office	96.9	50	YES			
Room 3C – Office	88.4	50	YES			
Room 22 – Women's restroom	52.6	5	YES			
Room 21 – Women's showers	67.2	5	YES			
Room 19 – Men's restroom	51.5	5	YES			
Room 18 – Men's showers	71.9	5	YES			
Restrooms hallway	83.1	5	YES			
Room 17 – Storage	31.0	30	YES			
Room 16 – Fitness room	17.2	30	NO			
Room 15 – Former indoor firing range	25.7	30	NO			
Room 1 – Drill hall	51.4	30	YES			
Room 10 – Foyer	44.2	5	YES			
Room 12 – Storage	35.3	30	YES			



August 21, 2010 Page 7

Army National Guard – Westminster Readiness Center Lighting Survey						
Location	Measurement in Foot Candles	Requirement in Foot Candles	Requirement Met?			
Room 13 – Boiler room	22.3	30	NO NO			
Room 9 – Kitchen	77.8	10	YES			
Room 9B – Kitchen storage	70.3	30	YES			
Room 9A – Kitchen pantry	58.8	30	YES			
Room 11 – POL room		Lights inoperable				
Room 14 – Supply		Inaccessible				
Room 14A – Vault		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 - 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 Westminster Army National Guard Readiness Center located at 350 Hahn Road in Westminster, 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 Non-Responsive on May 21, 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-Based Paint
- Lead Air Samples
- Ergonomics

- Temperature
- Relative Humidity
- Housekeeping



August 21, 2010 Page 8

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,



Principal Bonus Environmental, LLC

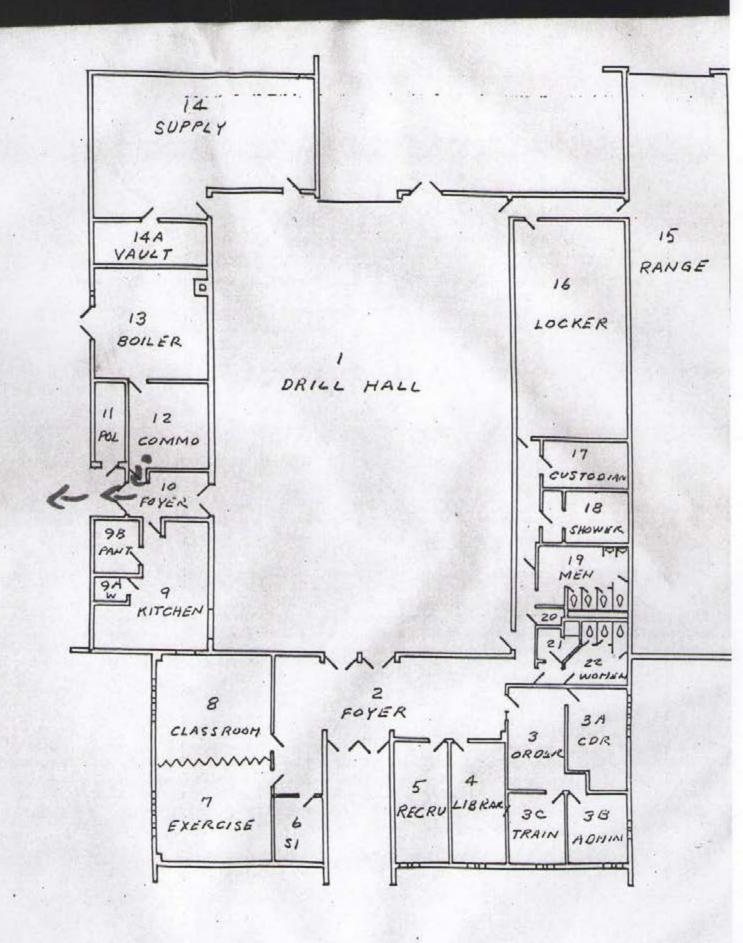


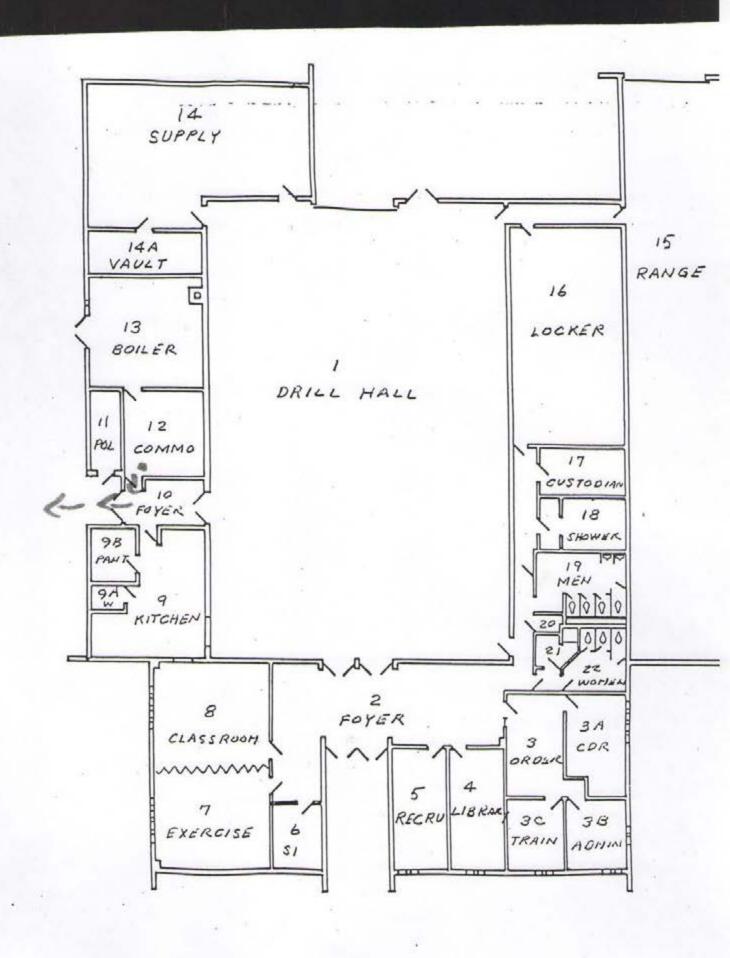
Principal Bonus Environmental, LLC

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Appendix A

Shop Diagram





Appendix B

Lead Sample Results

W

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

RECEIVED JUN 14 2010



100470

NY ELAP

5/24/2010

Date Submitted:

507201

Chain Of Custody:

Westminster Armory

Westminster, MD

Job Location:

301-IH Old Bay Lane, Attn: NGB-AVN-SI,

Address: Client:

May, 2018

National Guard Bureau

State Military Reservation

Havre de Grace, Maryland 21078

Posted to NGB FOIA Reading Room

Attention:

Job Name:

Report Date: 6/1/2010

Page 1 of 2

Comments

Final Result

Total ug

Reporting

Area Wiped

Air Volume

Sample Type

Analysis Type

Client Sample Number

AMA Sample

Number

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ug/m³ ng/m³

 ∇ \Diamond

ug/m³ ng/m³

ΑN

716 716

Air

Paint Chip

Air Blank

Flame Flame Flame Flame Flame Flame Flame Flame Flame

W-A-1 W-A-2 W-A-3

048097 048098 048099 048100 048101 048102 048103

 $^{8}_{P}$

ug∕A²

220

ng/ft² ng/ft₁ ug/ft²

<110

 $\rm ng/ff^2$ ug/ft²

110

0.111

** *** *** ***

0.111

0.111

**** ***

Wipe Blank

Wipe Wipe Wipe Wipe Wipe

W-W-2 W-W-3

W-W-1

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W-W-5

1048104

1048105 048106

W-W-6

W-W-4

ng∕ft² ug/ff² ng/ft²

0.111

0.111

230

ug/ft²

√ 110

<12

<12 26

6/1/2010

Date Analyzed:

Person Submitting:

Westminster Armory W912K6-09-A-0003

P.O. Number: Job Number:

Summary of Atomic Absorption Analysis for Lead

| 1048104 | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | Wipe | W.W. | Flame | W.W. |

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

An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS





Job Location: Job Name: 301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation National Guard Bureau

Westminster Armory

Westminster Armory W912K6-09-A-0003 Westminster, MD P.O. Number: Job Number:

Havre de Grace, Maryland 21078

Chain Of Custody:

507201

5/24/2010 Person Submitting: Date Submitted:

NY ELAP

6/1/2010

Report Date: 6/1/2010

Date Analyzed:

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2	Comments	
ead	Total ug Final Result	
Commission Priori Amarysis Inc Lead	ing Total ug	
U moral roc	ed Reporting Limit	
	te Area Wiped	
•	Air Volume (L)	
	Sample Type	
	Analysis Type	
	Client Sample Number	
	AMA Sample Number	

See QC Summary for analytical results of quality control samples NY ELAP accreditation applies only to paint chip, wipe, and soil ng/H^2 ~II0 associated with these sampes 84 samples. ug/ft² Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7421; Water: SM-3113B 110 110 Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B 0.111 mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm) *** ug/L = parts per billion (ppb) Analysis Method for Flame: Air, Wipes, Paints, and Soil/Soilds: EPA 600/R-93/
Analysis Method for Flame: Air, Wipes, Paints, and Soil/Soilds: EPA 600/R-93/
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Soilds: EPA 600/R-93/
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = mg/Kg = parts per million (ppm) by weight mg/L = mg/Kg = percent lead by weight ug = micrograms ug/L = parts per billion on Note: All samples were received in good condition unless otherwise noted.

1048115

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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.

Technical Manager:

4475 Forbes Blvd. • Lanham, MD, 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (301) 459-2643 An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

Address: Client:

Attention:





QC Summary

Sample Delivery Group: 19413

Analysis Type: Flame
Sample Type: Wipe
Analysis Date: 6/1/201

8 Date: 6/1/2010

100.88%

1.03%

Acceptable

	R	esuli	Percent Recovery	RPD	Сопушель
Preparation Blank	0.025	ppm			
Report Limit Verification Sample	0.3251	ppm	97.5%		Acceptable
Expected Spike Level (ppm) 0.3333					Acceptable
Duplicate Sample 1	-	mg/Kg	· · · ·		-
Duplicate Sample 2		mg/Kg	·		A
Matrix Spike Analysis					Acceptable
Spiked Sample					
Spike Duplicate	-				Acceptable
Laboratory Control Sample 1		-			Acceptable
Laboratory Control Sample 2	307,002	μβ	101.92%		Acceptable
recovered Conduit Samble 1	214 606		100.88%	1.636	

Calibration Information

Correlation of Calibration Curve: 0.999624

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
507201	48100	W-W-1
507201	48101	W-W-2
engle .		

SDG Number: 194t3

316 585

Page 1 of 2

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507201	48102	W-W-3
507201	48103	W-W-4
507201	48104	W-W-5
507201	48105	W-W-6
507201	48106	W-W-7
507201	48107	W-W-8
507201	48108	W-W-9
507201	48109	W-W-10
507201	48110	W-W-11
507201	48111	W-W-12
507201	48112	W-W-13
507201	48113	W-W-14
507201	48114	W-W-15
507201	48115	W-W-16
507201	48116	W-W-17

SDG Number: 19413 Page 2 of 2



Focused on Results!!



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 21

)	Results shal	be reported via emai	il to the following persons:
---	--------------	----------------------	------------------------------

National Guard Subcontractor

@bonusenvironmental.com

Non-Responsive_{IV NGB:}

ous.army.mil

CIV NGB:

- 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-Respons

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
office:	989-779-7686
(11:	989-621-3862

- 4) All Pb Wipes shall be handled in the following manner:
 - 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

Asbestos · Lead · Mold

507201

159202

CHAIN OF CUSTODY

OWI (410) 247-2024

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Ples E	

(Please Refer To This Number For Inquires)
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Number For Inquires) Sheet 10F	C, MD C, MD MOTOR MOTOR CO	nically feasible): Signature:	REP	The state of the s	4111	fedia (QTY) Q As (QTY) Q aratus for Spore Traps/Air Samples:	Spore-Trap Usurface Swah QTY; Surface Vacuum Dust QTY; Usurable ID Gross (Meda QTY) Dother Species, Meda QTY; Dother Species, Meda
	Submittal Information: 1. 505 Name: 2. 105 Location: West-MINSTEC, MD 3. 105 # West-MINSTEC, MD 4. Control B. Control B. West-MINSTEC, MD	minted by provided as soon as tech		(QTV) (QTV) (Y)	⁵ 42-19m/Dust 10648(1-99 (QTY)	-	(TEM Water samples C)
Mailing/Billing Information:	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	ER HOURS (must be pre-scheduled) e Date Due: Time Due:	Asbestos Analysis RM Air – Please Indicase Enter Tr	UNIOSH 7400 (QTY) Disherglass LEMAir Please Indicate Filter Type: UNIOSH 7402 (QTY)	U Other (specify	G Other (specify Were in the control of the contro	LASSESSES SOIJ PLM (Qual. PLM (Qual.) PLMTEM (Qual.) PLMTEM (Qual.) PLMTEM (Qual.) CLIENT ID SAMPI PLOCAMANTION

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CLIENT ID SA	W-A-3 W-A-3	- AM-T			&	CUSTODY)

50720 BEST AVAILABLE COPY (VTO) (VTO) with Report

Dod J. TANIY and Ments

Dus. army, mil (OTY) (013) 9 By: B. 210 REV. 6.08 B Initials: +days LABORATORY STAFF ONLY _(QTY) Q As @ phone # (410) 942-0273 _(OTY) ⊡ As_ L'Outturable ID Species (Madia_ ■ Culturable ID Genus (Media) @us.army.mi J Surface Vacuum Dust CLIENT CONTACT Confact: Contact: Collection Apparatus for Spore Traps/Air Samples: Contact: W912K6-09-A-0003 | Property | Copy | Copy | Property | Prope (OTY) LCu _(QTY) _ Cu__ (Please Refer To This Number For Inquires) Sign 159202 Time: - (QTY) ALMORY (973) -(QTY) -(QTY) Date/Time Date/Time Date/Time Collection Media, O Spore-Trap
O Surface Swab
O Surface Tape Submittal Information:
Westmin Ster Reporting Information (Results will be provided as soon as technically feasible); 8 MAS 3 2 5 3 8 0 0 0 J Other (Specify, a_{dVL} Job# West Minster Armora Job Location West Minster JAOdi JAOdi C Renults Required By Noon CHAIN OF CUSTODY (EveryAttempt Will Be Made to Accomodate) All samples received in good condition unless otherwise noted. .Date: -(QTY) --(QTY) LS/IG By (Print): ¥ 7 1 × (OTY) $y_{7/1g}$ (VT9) Submerted by Contact Persor OWI (410) 247-2024 H/V (OTY) Via: q_{ION} (QTY) LJ Quan. (s/area) Vacuum D5755-95. (QTY) By (Print): Qual. (pres/abs) Vacuum/Dust. O Quan. («/arca)Dust D6480-99 ŷ a_{Vi} Y ANALTS IS X X Y X ☐ Qual. (pres/abs) ☐ ELAP 198.2/EPA 100.2 ☐ EPA 100.1 ☐ ELAP 198.4/Chatfield C NY State PLM/TEM_ Via (TEM Water samples__ O 3 Day X 5 Day + Date Due: Residual Ash (9) u_{3J} 6 Fax #: __(410) 942-0254 TEM Water TEM Dust ミアハエ WIPE Attn: NGB-AVN-SI, State Military Reservation. AREA O menediale O Next Day AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920) (301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643 VOLUME LIERS) ĺ (Address 3: Havre de Grace, Maryland 21078. AMA Analytical Services, Inc. DATE (0TV) www.amalab.com -(OTY) (OTY) (QTY) 4475 Forbes Blvd. • Lunham, MD 20706 SAMPLE BOTORMATION 2. Date/Time Analyzed: 3. Results Reported To:_ 1. Date/Time RCVD:_ Client Name: National Guard Bureau -(QTY) Address 1: 301-IH Old Bay Lane SAMPLE LOCATION/ IDENTIFICATION SPICWELL HONDOW AFTER HOURS (must be pre-scheduled) (QTY) Achter Please Indicate Filter Type: 3 4. Comments: (QTY) Pm 7/8 (017) IEM Air - Please Indicate Filter Type: (QTY) Phone #: (410) 942-0273 Mailing/Billing Information: Ę, Grav. Reduction ELAP 198.6 ž 2 PLM Bulk © EPA 600 - Visual Estimate_ 5 ž Biler ş NY State Friable 198.1 Date Due: Time Due: EPA Point Count. O NIOSH 7402 Other (specify, Other (specify_ **LABORATORY** STAFF ONLY: Address 2: Fiberglass. CLIENT ID (CUSTODY) U AHERA NI MBER 01-m-m 81-M-M ベーターア アースース W-W-16 W-W-13 1-M-M としとし Ulmmediate アルーの D 24 Hours

Appendix C

Photograph

NGB/Army National Guard - Westminster Readiness Center Project No. 1061-03 August 21, 2010 Page 12



Building Exterior, west entrance



Boiler Rm., SE corner, water damage from ceiling down



Room 15, former indoor firing range



Boiler Room



Drill Hall



Kitchen, peeling LBP on north wall



NGB/Army National Guard - Westminster Readiness Center Project No. 1061-03 August 21, 2010 Page 13



Kitchen, water damaged ceiling



Room 15, damaged presumed asbestos containing 12"x12" floor tile

Appendix D

References



NGB/Army National Guard - Westminster Readiness Center Project No. 1061-03 August 21, 2010 Page 15

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NGB/Army National Guard - Westminster Readiness Center Project No. 1061-03 August 21, 2010 Page 16

- 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

NATIONAL GUARD BUREAU ARMY NATIONAL GUARD REGION NORTH INDUSTRIAL HYGIENE OFFICE ATTN: NGB-ARS-IHNE 301-IH OLD BAY LANE HAVRE DE GRACE, MD 21078

NGB-ARS-IHNE

10 October 2006

MEMORANDUM FOR Maryland Army National Guard (MDARNG) CFMO, LTC Robert McCabe, 5th Regiment Armory, 29th Division Street, Baltimore, MD 21201

SUBJECT: White Oak Readiness Center Indoor Firing Range

- 1. An email dated 09 October 2006 from the CFMO stated that the White Oak Readiness Center Indoor Firing Range conversion/construction project has been completed. This was based upon a physical inspection of the facility to ensure that it met requirements of the contract. The NGB Region North Industrial Hygiene Office certifies that the surface lead dust was abated IAW NG Pam 385-16, Converting Indoor Firing Ranges to Other Uses.
- 2. This project required the removal of the bullet trap, ceiling baffles and acoustical tile. Any items stored in the range were cleaned for surface lead dust prior to their removal. Surface lead dust was removed from all surfaces. Two coatings of lead paint encapsulant were used to cover the walls and ceiling. Vinyl tile was used to cover the floor.
- 3. This office collected pre and post surface lead wipe samples. The samples were sent to AMA Analytical Services, Inc. for analyses. AMA is an American Industrial Hygiene Association (AIHA) accredited laboratory. Post clearance surface lead wipe samples were below 200 micrograms per square foot as required by NG Pam 385-16.
- 4. Based on the email stated in paragraph 1 and the lead surface sample results, this area can be reoccupied as soon as possible.
- 5. Please direct any questions regarding the conversion/construction project to the CFMO at (410) 576-6067 and questions regarding surface lead dust sample results to Ms. Non-Responsive at (410) 942-0273 x23.



NGB Regional Industrial Hygienist



Non-Responsive

From: Non-Responsive CIV NGB

Sent: Tuesday, October 10, 2006 10:24 AM

To: Non-Responsive CIV

Subject: FW: White Oak Readiness Center, 12200 Cherry Hill Road, Silver Spring, MD 20904-1690

Non-Responsive

NGB Regional Industrial Hygienist Army National Guard ATTN: NGB-ARS-IHNE 301-IH Old Bay Lane Havre de Grace, MD 21078 410-942-0273 Ext 23 Cell 443-807-9605 FAX 410-942-0254

From: Non-Responsive LTC (RET) MDARNG
Sent: Monday, October 09, 2006 11:19 AM

To Non-Responsive CIV NGB; Non-Responsive A CIV NGB

CC TC MDARI TC (Ret) MDARNG

Subject: white Oak Readiness Center, 12200 Cherry Hill Road, Silver Spring, MD 20904-1690

.

Pursuant to the project specification, the above referenced project has been completed. The contractor:

Maryland Cleaning and Abatement Services

6811 York Road Baltimore, MD 21212

410-377-0500

MNon-Responsive

has completed the project per the specifications and all tests have meet the current standards of under 200 microns. The room has been fully encapsulated to current standards.

V/r Non-Responsive

PS: Wasn't sure that I sent this to you



A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Requested Record #J-15-008 (MD)
Released by National Guard Bureau
Page 5226 of 5269

Page I of I		lysis for Lead	Summary of Atomic Absorption Analysis for Lead	Summary of		
					Non-Re	Attention:
Report Date: 06-Jul-06	7/6/2006	Date Analyzed:	Not Provided	P.O. Number:		
	Non-Res	Person Submitting:	Not Provided	Job Number:	Havre de Grace, Maryland 21078	
	7/6/2006	Date Submitted:	Not Provided	Job Location:	301-IH Old Bay Lane, Attn: NGB-AVN-SI State Military Reservation	Address:
100476	148414	Chain Of Custody:	White Oak Armory (Silver Spring)	Job Name:	National Guard Bureau	Client:

			-		֡		
ater: SM-3113B		ater SM-2	17.77.71. W	600/R-93/200/N	Soil/Solids: EP/	Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids:EPA 600/R-93/200(M)-7421; Water: SM-3113B	ialysis Method For Furnac
SM-3111B	SM-3111B See QC Summary for analytical results of quality control samples	SM-3111	420; Water:	D/R-93/200(M)-7	il/Solids: EPA 60	ir, Wipes, Paints, and S	Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
N/A	N/A	X.	****		Wipe Blank	WO-31 Flame	0.663775
N/A	N/A	N.	****		Wipe Blank	WO-30 Flame	0663774
0.111	0.111	0.1	****	đ	Wipe	WO-29 Flame	0663773
0.111	0.111	0.1	*****		Wipe	WO-28 Flame	0663772
0.111	0.111	0.1	***	ē	Wipe	WO-27 Flame	0.663771
0.111	0.111	0.1	*****	ñ	Wipe	WO-26 Flame	0663770
0.111	0.111	0.1	****	ñ	Wipe	WO-25 Flame	0663769
0.111	0.111	1.0	****		Wipe	WO-24 Flame	0663768
0.111	0.111	0.1	***		Wipe	WO-23 Flame	0663767
0.111	0.111	0.1	****		Wipe	WO-22 Flame	0663766
0.111	0.111	0.1	****	ō	Wipe	WO-21 Flame	0663765

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AMA Sample

Client Sample

Analysis Type

Sample Type

Air Volume

Arca Wiped

Reporting Limit

Final Result

Comments

FOIA Requested Record #J-15

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 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. NVLAP, NIST, or any agency of the Federal Government. 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 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 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 All rights reserved. AMA Analytical Services, Inc.

Analyst:

Technical Manager:

Air and Wipe results are not corrected for any blank results should not be considered when interpreting the result

Note: All results have two significant digits. Any additional digits shown Note: All samples were received in good condition unless otherwise noted. %Pb = percent lead by weight

ug ≖ micrograms

ug/L = parts per billion (ppb)



AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 13186

	Auslysis Type: Sample Type: Auslysis Date: Result		Flanc Wipe 7/6/2006		
			Percent Recovery	KPD	Comment
Preparation Blank	0.117	թնա			Acceptable
Report Limit Verification Sample	0.6053	թ թա	181.6%		Outside Limits
Expected Spike Level (ppm) 0.3333					
Duplicate Sample 1	#Numl	mg/Kg			
Duplicate Sample 2	#Num!	mg/Kg		#Error	#Iltror
Matrix Spike Analysis					
Spiked Sample			114.79%		Acceptable
Spike Duplicate	•		·		Acceptable
Laboratory Control Sample 1	283.748	ив .	94.62%	·	Acceptable
Laboratory Control Sample 2	292.094	μg	97.91%	3.41%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999338

All calibration verification samples are within acceptance limits.

Notes: Recovery for the Report Limit Verification Sample was 181.6%, above the upper control limit of 120%.

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	y - AMA Sample Number -	Client Sample Number
1484)4	63765	WO-21
148414	63766	WO-22
SDG Number:	13186	

Page 1 of 2

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
148414	63767	WO-23
148414	63768	WO-24
148414	63769	WO-25
148414	63770	WO-26
148414	63771	WO-27
148414	63772	WO-28
148414	63773	WO-29
148414	63774	WO-30
148414	63775	WO-31
153885	63776	0607056-01
153885	63777	060705E-02
153885	63778	0607056-03
153885	63779	0607056-04
153885	63780	060705H-05
153885	63781	06070\$E-06
153885	63782	06070515-07
153885	63783	060705E-08

SDG Number: 131R6 Page 2 of 2

NGB-AVS-SG

SUBJECT: All States (Log Number P01-0075) Army National Guard (ARNG) Safety and Occupational Health Program -- POLICY AND RESPONSIBILITIES FOR INSPECTION, EVALUATION AND OPERATION OF ARMY NATIONAL GUARD INDOOR FIRING RANGES

APPENDIX G SURFACE WIPE SAMPLING SHEET

	Industrial H	lygiene Sur	face Wipe Sa	mple Shee	t			
Return Address	, NGB Region N LBay Lane		Non-Res	ponsive				
	race MD 211	078	Non-Re	Spons	ive			
				Location (bld				
				IFR				
Description of C	-	I .	ate Collected & July 06	_	Date Shipped 6 July 06			
Analysis Desire	iring Range d · Lead		·	?				
Sampling Data								
Lab Use Only	Sample #	Results	Remarks					
	W0-21		right lane,	at bullet to	rap on tloor			
	W0-22		mid lane, at built trap on floor					
	W0-23		left lane, at corner by built trap on floor					
	WO-24		right side wall, 3ft. up, where green par begins					
	WO-25		Center lane, 15ft. from firing line					
	WO-26		left lane, 2		<u> </u>			
	WO-27		top of stair	•				
	WO-28				ding to armory			
	WO-29		new just in	side door	of range			
	Blank, wo-3)						
	Blank, WO-31							
Comments to L	ab. ² templet u	sed Ple	Pase repor	t in ug	142			

AMM 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)

148414

Abbestos Analysis Carlo Flees Fleet Type	Park Copy; @ fix #
TEM_Bulls	Pack Copy: @ fax # Len
TEM Bulk Lea	Peac Copy: @ fax #
TEM_Bulk Lean CQTY) C CQTY Pex Copy: @ fax # Len	
TEM_Bulk	Dear Dear Dear Dear Dear Dear Dear Dear
TEM_Bulk	Cell # CPAX COpy: @ fax # Lea
Lem Bulk	Pex Copy: @ fax # Lea
TEM Bulk Cocation Color	Pex Copy; @ fax # Lea
TEMBulk	Cell #
TEM_Bulk	Fax Copy:
TEM_Bulk	Cell #
TEM_Bulk	Cell # Clex Copy; @ fax # Lea
TEM_Bulk	Cell # C Fax Copy; @ fax # Lean Pe: C ELAP 198.4/Chatfield (QTY) C TY) C ELAP 198.4/Chatfield (QTY) C C C C C C C C C C C C C
TEM_Bulk	Gell#
TEM_Bulk	. @ cell # □ Fax Copy; @ fax # Lean pe: □ ELAP 198.4/Chaffield (QTY) 25mm 37mm □ LEAP 198.4/Chaffield (QTY) 27 □ Residual Ash (QTY) 17 □ Qual. (pres/abs) Vacuum/Dust (QTY) 25mm 37mm □ Quan. (s/area) Vacuum/Dust (QTY) 2 □ Quan. (s/area) Ust D6480-99 (QTY) (QTY) □ Quan. (gres/abs) (QTY) (QTY) □ Quan. (gres/abs) (QTY)
TEM_Bulk	_@ cell # ☐ Fax Copy;
TEM_Bulk	_@ cell# ☐ Fax Copy;
TEM Bulk D ELAP 198.4/Chaffield (QTY) mm 37mm D NY State PLM/TEM (QTY) Residual Ash (QTY)	_@ cell#
TEM Bulk DELAP 198.4/Chaffield (QTY)	_@ cell#
	_ @ cell# @ fax #
r sheets with results Reporting Information (Results will be provided as soon as 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
27.3 Fax #: 4/10-942-0254 5. Submitted by sheets with results Reporting Information (Results will be provided as so 1/11-11-12-14-15. Submitted by sheets with results Reporting Information (Results will be provided as so 1/11-11-14-14-14-14-14-14-14-14-14-14-14-1	Fax #. 410-942-0254 5. Submitted b
De Grace MA 21078 3. Job #:	70\(\) 2(07\(\) 3. Job #:
OLd Bay Lane 2. Job Location: e Grace, MA 21078 3. Job #: e Grace, MA 21078 4. Contact Per 4. Contact Per 5. Submitted b 273 Fax #: 410-942-0254 5. Submitted b t sheets with results Reporting Information (Results will be provided as 30 mills) 1/1/1/40 @ 1040 Immd 1/224ir 348hr 372hr 5 Day +	2. Job Location: 2. Job Location: 3. Job #: 4. Contact Per: Fax #: 410-942-0254 5. Submitted b

Analytical Services, Inc.



A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Address: Client: 301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation National Guard Bureau

Havre de Grace, Maryland 21078

Job Name: White Oak Armory (Silver Spring)

Job Location: Not Provided

> Date Submitted: Chain Of Custody:

> 148416 7/18/2006

Summary of Atomic Absorption Analysis for Lead Sample Type P.O. Number: Job Number: Air Volume Not Provided Not Provided Area Wiped Reporting Person Submitting: Date Analyzed: Final Result 7/19/2006 Report Date: Comments 19-Jul-06 Page 1 of 2

Client Sample Number Analysis Type Ŧ

AMA Sample Number

Attention:

WO-41 Flame Wipe Blank	Flame	Flame				WO-35	WO-34	WO-33	WO-32
			Flame	Flame	Ę				
Wipe Wipe Blank	Wipe	٧:			ame	Flame	Flame	Flame	Flame
		Vipe	Wipe	Wipe	Wipe	Paint Chip	Wipe	Wipe	Wipe
* * *	***	***	***	* * *	***	***	***	**************************************	***
0.111	0.111	0.111	0.111	0.111	0.111	N/A	0.111	0.111	0.111
108.01	108.01	108.01	108.01	108.01	108.01	0.01	108.01	108.01	108.01
ug/ft²	ug/ft²	ug/ft²	ug∕ft²	ս <i>ք/</i> ք²	ug∕ft²	%РЬ	ug∕ft²	ug/ft²	ug/ft²
۸ ۸						_			
110	140	130	140	950	840),026	180	220	260
ຫຍ ທ _{ິວ} / ໂ ລ	ug/ft²	ug/ft²	ug/ft²	ug/ft²	ug/ft²	%Pb	ug/ft²	ug/ft²	ug/ft²
							**	*	220 ug/ft² 180 ug/ft² 0.026 %Pb 840 ug/ft² 950 ug/ft² 140 ug/ft² 140 ug/ft² 140 ug/ft² 140 ug/ft²

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So 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 Laboringies, the report applies only to 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 to the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization. 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. 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 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 All rights reserved. AMA Analytical Services, Inc.

4475 Forbes Bivd. • Lanham. MD 28786 • (381) 459-2648 • Toll Free (888) 346-0961 • Fax (381) 459-2643 An AIHA (#8863), NVLAP (# 101143). & New York ELAP (#10920) Accredited Laboratory

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FOIA Requested Record #J-15

Requested Record #J-15-003 MD Released by National Guard Bureau Page 5231 of 5269



A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Address: Client: 301-IH Old Bay Lane, Atm: NGB-AVN-SI, Havre de Grace, Maryland 21078 State Military Reservation National Guard Bureau Job Number: Job Location: Job Name: Not Provided Not Provided White Oak Annory (Silver Spring) Chain Of Custody: Date Submitted: Person Submitting: 148416

P.O. Number:

Not Provided

7/18/2006

Date Analyzed:

7/19/2006

Report Date:

19-Jul-06

Requested Record #J-15

Requested Record #J-15-008 (MD)
Released by National Guard Bureau
Page 5232 of 5269

Page 2 of 2

Summary of Atomic Absorption Analysis for Lead

Reporting Final Result Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SN-3111B Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7421; Water: SM-3113B associated with these samples See QC Summary for analytical results of quality control samples

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

Note: All samples were received in good condition unless otherwise noted should not be considered when interpreting the result. Note: All results have two significant digits. Any additional digits shown

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N/A = Not Applicable

AMA Sample

Client Sample

Analysis Type

Sample Type

Air Volume

Area Wiped

Attention:

Air and Wipe results are not corrected for any blank results

Analyst:

Technical Manager:

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E So So So 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 public ymatter without prior written authorative 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 authorative. 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 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 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 All rights reserved. AMA Analytical Services, Inc.

NVLAP, NIST, or any agency of the Federal Government.



AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 13242

	Analysis Type; Sample Type; Analysis Date; Result		Flame Wipe 7/18/2006		
			Percent Recovery	RPD	Comment
Preparetion Hlank	0.037	ppm			Acceptable
Report Limit Verification Sample	0.4182	ppm	125.5%		Outside Limits
Expected Spike Level (ppm) 0.3333					_
Duplicate Sample 1	#Norm	mg/Kg			
Duplicate Sample 2	#Num!	mg/Kg		#1Epron	#Error
Matrix Spike Analysis	·				
Spiked Sample	•		113.94%		Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample I	272.217	 µg	90,20%		Acceptable
Laboratory Control Sample 2	260.150	#8 #8	93.16%	3.23%	Acceptable

Calibration Information

Carrelation of Calibration Curve:

0.998282

All calibration verification samples are within acceptance limits.

Notes:

Recovery for the Report Limit Verification Sample was 125.5%, above the upper control limit of 120%. A passing Report Limit Verification sample for wipe samples for this analysis date can be found with SDG 13238 (105.4% recovery).

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
148416	67506	WO-32
148416	67507	V(O-33
OG Number:	3242	

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
148416	67508	WO-34
148416	67510	₩0-36
148416	67511	WO-37
148416	67512	WO-38
148416	67513	WO-39
148416	67514	WO-40
148416	67515	WO-41
1-18416	67516	WO-42
148416	67517	WO-43
1\$5393	67535	15-DOW
155393	67536	16-DOW
155393	67537	L-7-DOW
155393	67538	18-DOW
155393	67539	1.9-DOW

SDG Number: 13242 Page 2 of 2



AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 13243

Analysis Type:

Flame

Sample Type:

Point Chip

Analysis Date:

7/19/2006

	Result		Percent Recovery	מינו	Comment	
Prepáration Blánk	0.058	ppm			Acceptable	
Report Limit Verification Sample	0.3433	ը թա	103.0%		Accentable	
Expected Spike Level (ppm) 0.3333						
Duplicate Sample 1	226	mg/Kg				
Duplicate Sample 2	220	mg/Xg	•	2.59%	Acceptable	
Matrix Spike Analysis						
Spiked Sample					Acceptable	
Spike Duplicate					Acceptable	
Laboratory Control Sample 1	327.326	μχ	85.26%		Acceptable	
Laboratory Control Sample 2	239.535	μұ	85.42%	0.18%	Acceptable	

Calibration Information

Correlation of Calibration Curve:

0.998729

All callbration verification samples are within acceptance limits.

Notes:

Insufficient sample submitted for spike or spike dupficate analysis.

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody AMA Sample Number Client Sample Number

148416

67509

WO-35

154843

67618

071706-307 Cotton

SDG Number:

13243

Page Lof I

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SUBJECT: All States (Log Number P01-0075) Army National Guard (ARNG) Safety and Occupational Health Program -- POLICY AND RESPONSIBILITIES FOR INSPECTION, EVALUATION AND OPERATION OF ARMY NATIONAL GUARD INDOOR FIRING RANGES

APPENDIX G SURFACE WIPE SAMPLING SHEET

•	Industrial H	ygiene S	urface Wipe Sa	mple She	et				
4	-		Point of Contact Non-Res Samples Collect	ponsive	ne#) 410-942-0273				
	Grace MD 21	018	Non-Respons						
Sampled Facilit	y 5,7	ver Spri	ng State	Location (b)	ldg/area)				
Description of Condoor File			Date Collected 18 July 200	06	Date Shipped 18 July 2006				
Analysis Desire	Lead								
Sampling Data									
Lab Use Only	Sample #	Results	Remarks						
	W0-32		Right lanc, a		•				
	W0-33		right side wall, about 3ft up. is sample the green paint. (Bulk.)						
	WO-34								
	WO-35								
	WO-36		Inght side w	paint tegins center where given paint tegins					
	W0-37		1		_				
	WO-38		left lane,	2044 Fra	m firing line				
	WO-39		tup of stai	•					
	WO-40 .		arming.		eading to the				
	WO-41		Just insid	Just inside door to range, an floor					
	WO-42/blank	•	blank						
	WO-43/Hank		blank						
Comments to L		used.	Ricasc tepor	t in	u9/ft2				



A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Requested Record #J-15-0085 MD)
Released by National Guard Bureau
Page 5237 of 5269 2

Address: Client: 301-IH Old Bay Lane, Attn: NGB-AVN-SI, Havre de Grace, Maryland 21078 State Military Reservation National Guard Bureau Job Number: Job Location: Job Name: Not Provided White Oak Silver Spring, MD-IFR Converted IFR

P.O. Number:

Not Provided

Date Submitted: Chain Of Custody: 8/2/2006 148417

Person Submitting: Date Analyzed:

8/2/2006

Report Date:

02-Aug-06

FOIA Requested Record #J-15-

Page 1 of I

Summary of Atomic Absorption Analysis for Lead

Air Volume Area Wiped Reporting Limit Final Result

Comments

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AMA Sample

Client Sample

Analysis Type

Sample Type

Attention:

Number

N/A = Not Applicable Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7421; Water: SM-3113B Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B 0671721 0671716 0671722 0671720 0671715 0671725 0671724 0671723 0671718 0671717 0671719 WO-108 mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm) WO-110 WO-109 WO-107 WO-106 WO-105 WO-104 WO-103 ₩Q-102 WO-10 WO-100 Flame Flame Flame Flame Flame Flame Flame Flame Flame Flame Flame Wipe Blank Wipe Blank Wipe Wipe Wipe Wipe Wipe Wipe Wipe **** *** **** *** *** *** 安务条条 **** *** **** *** 0.111 0.111 0.111 0.111 0.111 0.111 0.111 0.111 0.111 N/A associated with these samples. See QC Summary for analytical results of quality control samples 108.01 108.01 108.01 108.01 108.01 108.01 108.01 108.01 108.01 12.00 ug/ft² ug/ft² ug/ft² ug/ft³ ug/ft² 엺 ug/ft² ug/ft² ٨ ٨ 110 110 110 110 110 110 011 120 12 ug/ft² ug∕ft² ug/ft² ug/∄³ ug/ft³ ug/ft² ug/ft² ug/ft² Sn.

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Technical Manager:

Room

Air and Wipe results are not corrected for any blank results should not be considered when interpreting the result Note: All results have two significant digits. Any additional digits shown Note: All samples were received in good condition unless otherwise noted %Pb = percent lead by weight

ug = micrograms

ug/L = parts per billion (ppb)

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 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 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 authorized in the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorized in the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorized in the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorized in the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorized in the condition of the condition 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 Labograteries. NVLAP, NIST, or any agency of the Federal Government. 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 All rights reserved. AMA Analytical Services, Inc.

Analyst:

An AIHA (#8863), NVLAP (# 101143), & New York ELAP (#10920) Accredited Laboratory



AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 13311

Plante Analysis Type: Wipe Sample Type: Analysis Date: 8/2/2006 Result Percent RPD Comment Recovery **Десертаble** 0.083 րբու Preparation Blank 122.1% Quiside Limits 0.4071 ppm Report Limit Verification Sample Expected Spike Level (ppm) mg/Kg #Num1 Duplicate Sample 1 #15rcor #IErron #Num! mg/Kg Duplicate Sample 2 Matrix Spike Analysis Acceptable 112.73% Spiked Sample Acceptable Spike Duplicate 91.77% Acceptable Laboratory Control Sample 1 282.893 μგ 91.71% 0.07% Acceptable

Calibration Information

Correlation of Calibration Curve:

Laboratory Control Sample 2

0.999763

278,678

All calibration verification samples are within acceptance limits.

Notes:

Recovery for the Report Limit Verification Sample was 122.1% above the upper control limit of 120% A passing Report Limit Verification sample for wipe samples for this analysis date can be found with SDO 13308 (111.01% recovery).

Samples included in this Sample Delivery Group (SDG)

Chain Of Custo	dy - AMA Sample No	nber Clie	nt Sample Nu	mber		
148417	71715		WO-100			
148417	71716		WO-101			
SDG Number:	13311				 	 Page I of 2

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
148417	71717	WO-102
148417	71718	WO-103
148417	71719	WO-104
148417	71720	WO-105
148417	7172t	WO-106
148417	71722	WO-107
148417	71723	WO-108
148417	71724	WO-109
148417	71725	WO-110

SDG Number: 13311 Page 2 of 2

APPENDIX F

SURFACE WIPE SAMPLING SHEET

	Point of Conta	ipe Sam	nhone #)	
Return Address	Non-Responsiv	10-942-02	73 Ext 25	
Region North IH	1			
301-IH Old Bay Lane	Samples Con Berckthan	on-Respor	nsive	
Havre De Grace, MD 21078				
Sampled Facility	City	State	Location	n (bldg/area)
White Oak Sih	erspring	VVID	1/FA	2
Description of Operation	Date Collected	l l	Date Shipped	1
Converted IFR	2 Aug	υĢ	2 Aug 01	•
Analysis Desired			· · · · · ·	
Lead				
Sampling Data				
Location	Sample a	#	Results	Remarks
Right-Lane (Lane 5) at Bullet trap	W0-100		resums	Remarks
Middle lane (tane 3) at Bullet trap On Floor	WO -101			
Leftlane (lane) in corner	W0-102	-		
Rightwall, 3ft up, where green paint begins Penkelune (3) 15ft from	WO -103			
Left Lene(1) 15 ft from	W0-104			
Firing Line	WD-105			
top of stairs, on Floor	WO-106			
on Ploor, just inside outer door to Aring range on Floor, just inside range door	WO-107			
	WO-108			
BLANK	WD-100	1		
BLANK	WO-110)		
BEARRECAL	AND SEE			
Comments to Lab:	PAT			

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)

148417

		Lagr	Down	100501	Lased	1000-000	1.77		AVAILABLE COPY
Date/Time RCVD: Date/Time Analyzed: Results Reported To:	LABORATORY STA	WD-1109	KO) - aM		T IN L	VO-102	101-0M	138	Mailing/Billing Information: 1. Client Name: \(\lambda \lambda \tau \tau \lambda \la
e Analyzed:/ eported To:/	LABORATORY STAFF ONLY: (CUSTODY)							SAMPLE INFORMATION SAMPLE LOCATION IDENTIFICATION DATE	Poell # CONY) O(O(Y)) O(O(Y)
		<						VOLUME	
(人) @ 「(ハ) Viaウロウム - /		*					1 7 7 7 7	TEM	Submittal Information: 1. Job Name: CONLECT 2. Job Location: Winter 2. Lot Name: CONLECT 3. Job # 2. Job Location: Winter 4. Contact Perso 4. Contact Perso 4. Contact Perso 5. Submitted by: Fax Copy: Grax Gopy: Grax Gray Gray
via CM Cul D							- 2	ANALYSIS PLM / FLM / MOLD	Submittal Information:
hate: \S_/_								AIR BULK DUST MATRIX VARIABLE AND AND AND AND AND AND AND AND AND AND	Job Name: CONVECTED Job Location: WWAITE CX Job # Contact Perso Contact Perso Submitted by: Ibe provided as soon as tech (QTY)
m 9/ピロス	NA A							CRUX Spirit Bar Spirit PE SWAB	P.O. #.— Signate technically feasible): md. After-Hours #24hr After Day Email Copy Lead Analysis Paint Chip27 Dust Wipe (v) Q Air
Time:)		Date/Time:		Date/Time:		Date/Time:		P.O. #:
Initials:			Contact:		Contact:		Contact:	CLIENT CONTACT LABORATORY STAFF ONLY	bone #
	Pested to May, 2018	NGB F	₩ X	eading	By:		By:		
									Page 5241 of 526

CERTIFICATE OF ANALYSIS

	AMA
A Specialized Environmental Laboratory	Analytical Services, In

			Address:	Clients
Res		Havre de Grace, Maryland 21078	301-tH Old Bay Lane, Attn. NGB-AVN-SI, State Military Reservation	National Guard Bureau
	P.O. Number:	Job Number:	Job Location:	Job Name:
	Not Provided	Not Provided	Not Provided	White Oak Armory (Silver Spring MD)
	Date Analyzed:	Person Submitting:	Date Submitted:	Chain Of Custody:
	6/21/2006	Non-Res	6/21/2006	150757
	6/21/2006 Report Date:			

		Attention:
		Non-Re
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	of Atomic	
	Summary of Atomic Absorption Analysis for	
	nalysis for Leac	,
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	Page 1 of 2	

WO-01 Flame Wipe **** 0.111 108.01 ug/ft² 110 WO-02 Flame Wipe **** 0.111 108.01 ug/ft² 110 WO-03 Flame Wipe **** 0.111 108.01 ug/ft² 110 WO-04 Flame Wipe **** 0.111 108.01 ug/ft² 190 WO-05 Flame Wipe **** 0.111 108.01 ug/ft² 190 WO-06 Flame Wipe **** 0.111 108.01 ug/ft² 430 WO-07 Flame Wipe **** 0.111 108.01 ug/ft² 430 WO-08 Flame Wipe **** 0.111 108.01 ug/ft² 430 WO-08 Flame Wipe **** 0.111 108.01 ug/ft² 430 WO-08 Flame Wipe **** 0.111 108.01 ug/ft	WO-01 Flame Wipe **** 0.111 108.01 ug/ft² < 110 WO-02 Flame Wipe **** 0.111 108.01 ug/ft² < 110 WO-03 Flame Wipe **** 0.111 108.01 ug/ft² < 110 WO-04 Flame Wipe **** 0.111 108.01 ug/ft² < 110 WO-05 Flame Wipe **** 0.111 108.01 ug/ft² 190 WO-06 Flame Wipe **** 0.111 108.01 ug/ft² 430 WO-07 Flame Wipe **** 0.111 108.01 ug/ft² 430 WO-08 Flame Wipe **** 0.111 108.01 ug/ft² 430	Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result		250 ug/ft 250 ug/ft 260 ug/ft 110 ug/ft 12 ug	^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^	90 11,90 14,60 14,	108.01 108.01 108.01 108.01 108.01 108.01 108.01 108.01 12.00	N/N N/N 0.111 0.111 0.111 0.111 0.111 0.111 0.111		Wipe Wipe Wipe Wipe Wipe Wipe Wipe Wipe	Flame Flame Flame Flame Flame Flame Flame Flame Flame Flame Flame Flame Flame Flame	March Marc	0659372 0659373 0659374 0659375 0659376 0659377 0659377 0659379 0659380 0659381
WO-01 Flame Wipe **** 0.111 108.01 ug/ft² < 110 WO-02 Flame Wipe **** 0.111 108.01 ug/ft² < 110	WO-61 Flame Wipe **** 0.111 108.01 ug/ft² < 110 WO-02 Flame Wipe **** 0.111 108.01 ug/ft² < 110 WO-03 Flame Wipe **** 0.111 108.01 ug/ft² < 110 WO-04 Flame Wipe **** 0.111 108.01 ug/ft² < 110 WO-05 Flame Wipe **** 0.111 108.01 ug/ft² 190 WO-06 Flame Wipe **** 0.111 108.01 ug/ft² 430 WO-07 Flame Wipe **** 0.111 108.01 ug/ft² 430	Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result WO-01 Itlame Wipe **** 0.111 108.01 ug/ft² < 110	X 12 1				108.01	0.11	* * * * *	¥ipc	Flame	WO-08	0659370
WO-01 Plante Wipe **** 0.111 108.01 ug/ft² 110 WO-02 Flame Wipe ***** 0.111 108.01 ug/ft² 110 WO-03 Flame Wipe ***** 0.111 108.01 ug/ft² 110 WO-05 Flame Wipe ***** 0.111 108.01 ug/ft² 3700 WO-05 Flame Wipe **** 0.111 108.01 ug/ft² 190	WO-01 Plame Wipe **** 0.111 108.01 ug/ft² < 110 WO-02 Flame Wipe **** 0.111 108.01 ug/ft² < 110	Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result WO-01 Flame Wipe ***** 0.111 168.01 ug/ft² < 110	T T		A	ug/ft² ug/ft²	108.01	0 H C	* * * * * *	₩ij¢	Flame Flame	WO-06 WO-07	0659368 0659369
WO-01 Plants Wipe **** 0.111 108.01 ug/ft² < 110 WO-02 Flants Wipe **** 0.111 108.01 ug/ft² < 110	WO-01 Plame Wipe **** 0.111 108.01 ug/ft² < 110 WO-02 Flame Wipe **** 0.111 108.01 ug/ft² < 110 WO-03 Flame Wipe **** 0.111 108.01 ug/ft² < 110 WO-04 Flame Wipe **** 0.111 108.01 ug/ft² < 110	Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result Number (L) (ff) Limit WO-01 Plame Wipe 0.111 108.01 ug/ft² < 110	***			ug/ft²	108.01	0.111	***	Wipe	Flame	WO-05	0659367
WO-01 Name Wipe **** 0.111 108.01 ug/ft² < 110 WO-02 Flame Wipe **** 0.111 108.01 ug/ft² < 110	WO-01 Plame Wipe **** 0.111 108.01 ug/fit* < 110 WO-02 Flame Wipe **** 0.111 108.01 ug/fit* < 110 WO-03 Flame Wipe **** 0.111 108.01 ug/fit < 110	Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result Number (L) (ff) Limit WO-01 Plame Wipe ***** 0.111 108.01 ug/ft² < 110	***		ц	mg/h ²	108.01	111.0	X	Wipe	Flame	40-0w	0659366
WO-01 Mame Wipe **** 0.111 108.01 ug/ft ² < 110 WO-02 Flame Wipe **** 0.111 108.01 ug/ft ² < 110	WO-01 Plame Wipe **** 0.111 108.01 ug/ft² < 110 WO-02 Flame Wipe **** 0.111 108.01 ug/ft² < 110	Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result Number (L) (ff) Limit W0-01 Plame Wipe **** 0.111 108.01 ug/ft ² < 110 ug/ft ² W0-02 Flame Wipe **** 0.111 108.01 ug/ft ² < 110 ug/ft ²	45			:Ti/Gu		0.111	*	Wipe	Flame	WO-03	0659365
WO-01 Plants Wipe **** 0.111 108.01 ug/fts < 110	WO-01 Plame Wipe **** 0.111 108.01 ug/ft² < 110	Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result Number (L) (ff) Limit WO-01 Plame Wipe **** 0.111 168.01 ug/ft ² < 110 ug/ft ²	4			ા મુખ્યા	10.201	0.111	* * *	Wipe	Flame	WO-02	0659364
		Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result Number (L) (fr) Limit	75		^	ນຍູກຳເ		0,111	***	Wipe	Plame	10-0W	0659363

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 Covernment.

FOIA Requested Record #J-15-0085 (100) Released by National Guard Bureau Page 5242 of 5269

21-Jun-06

NGB-AVS-SG

SUBJECT: All States (Log Number P01-0075) Army National Guard (ARNG) Safety and Occupational Health Program -- POLICY AND RESPONSIBILITIES FOR INSPECTION, EVALUATION AND OPERATION OF ARMY NATIONAL GUARD INDOOR FIRING RANGES

APPENDIX G SURFACE WIPE SAMPLING SHEET

	Industria	al Hygiene S	Surface Wipe Sa	mple Sheet
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THEORE	Firing	RANGE	Date Collected つりしにいつ!	6 20 7 CM 06
Analysis Desir	ed	N-		- 33374 04
Sampling Data				
Lab Use Only	Sample #	Results	3	Remarks
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	WO 2		BACK 340R	MGE ROOM RY WAIT
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	W0-4		Elocator, A	A ROUGH ABOUT ON
	WO-5		E VV DI PUNCUS	Me, Behines bullet 1.
	world		@ Errians	LON Floor corner
	wo-7		RI SIDE ON	2 MAILWARE, GEREN HAIN
	WO-8		I WALL W	HERRING HERRING STAN
	wo-9			
	WO-10)	middle in	TROM FIRING LINE
	WO-11		LT. LAMP, C	in Stock so le liter
	wo-12		on flock	M FROM PORT IN THE
Comments to !	Lab:			

NGB-AVS-SG

SUBJECT: All States (Log Number P01-0075) Army National Guard (ARNG) Safety and Occupational Health Program -- POLICY AND RESPONSIBILITIES FOR INSPECTION, EVALUATION AND OPERATION OF ARMY NATIONAL GUARD INDOOR FIRING RANGES

APPENDIX G SURFACE WIPE SAMPLING SHEET

		al Hygiene S	urface Wipe Sa	mple Sheet
Return Addres	ARNE		Point of Contac	t (name & phone #)
301-11	H CID B	ay Lane		510-442-0543
HAURE	de Grac	c, mo ajo	Samples Collection Non-Response	eted By DISIVE
Sampled Facili		City	State	Location (bidg/area)
White Or		Silver Spein		IFR
Description of	Operation Fireing F	Samo	Date Collected	Date Shipped
Analysis Desir		cural(20 Jun 06	30 JUNG6
LEAD				
Sampling Data		·		
Lab Use Only	Sample #	Results		Remarks
	LC0-13		04 / COR	Remarks 10 10 10 10 10 10 10 10 10 10 10 10 10 1
	WO-14		ONFICOR	at portion of 34
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	WO-15		JEAD! NI	16 02 A11 21 41 8
	WO-16		AT TOD	SC STAIRS ON PI
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	WO-18		ON Floo	ALMORY POLY
	WO-19	Bland		JO HENGICY FOCA
	w0-20	BANK		
		1		

AMA Analytical Services, Inc.

AIHA (#100470) NVL.AP (#101143-0) NY ELAP (10920) 4475 Forbes Bivd. • 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:	Bukka	Submittal Information:		A RAMORY	A 237.7	JON ACK
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Address 2: HAVRE OR (JRACE,	MEDIA AM	3. Job #:	P.O	P.O. #.		1
Address 3:	カイン・クログ・クログ	4. Contact Perso	Respon	@ phone # ~1 K	イン・マステ・ジア	7
shoets with results	orting Information (Result	펻	l .	Signature:	A STATE OF THE STA	
(6)	☐ Immd X24hr ☐	□Immd. 124hr □48hr □72hr □5 Day + □Immd. After-Hours* □24hr After-Hours* □Late-Night* (*must be pre-scheduled)	r-Hours* □24h	r After-Hours* 🗀 Late	-Night* (*must be pre-	cheduled)
☐ Verbels: @ cell #	☐ Fax Copy:	@ fax #	D Email Copy:	Copy:	(8)	
Asbestos Analysis PCM Air Piease Indicate Filter Type: PC MCF Provisity in a 25mm 37mm	TEM Bulk U ELAP 198,4/Chaffeld UNY State PI M/TEM	leid(QTY)	Lead Analysis U Paint Chip. Dust Wine	1 Analysis U Paint Chip O Dust Wine (wine road A)	000	Ş
☐ NIOSH 7400 (QTY) ☐ Frberglass (QTY)	TEM Dust	(XIX)	☐ Air ☐ Soil/Solid_	olid (QTY)		ì
Indicate Filt	☐ Qual. (pres/abs) Vacuum/Dust ☐ Quan. (s/area) Vacuum DS755-95	-95	O TOLE	ater(QTY)	(QTY)	
Other (specify).	D Quan. (s/area)Dust D6480-99. TEM Water		U Waste	☐ Waste Water(QT	(QTY)	BEST
ual Estimate (OTV)	☐ ELAP 198.2/EPA 100.2 ☐ EPA 100.1	002(QTY)	Mold - Direct Micr	copic	S □ Bulk(QTY)	T AVAI
ELAP 198.1	☐ All samples receive (TEM Water samples.	☐ All samples received in good condition unless otherwise noted. (TEM Water samples, °C)	O Surface Tape.		_ (QTY) ☐ Surface Vacuum Dust (QTY) ☐ Other (Specify)	(AB)
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LABORATORY STAFF ONLY: (CUSTODY)	. @ Via:	By (Print):		Sign:		
2. Date/Time Analyzed:	By (Print):		Sign:			
3. Results Reported To:	Via:	t: Date: /		Time:	Initials:	
4. Comments:				***************************************		

Posted to NGB FOIA Reading Room May, 2018

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 5245 of 5269

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CHAIN OF CUSTODY

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150757

102:221 AVAILABLE COPY □Immd. ∑24hr. □48hr. □72hr. □5 Day + □Immd. After-Hours* □24hr After-Hours* □Late-Night* (*must be pre-scheduled) . ? B. ž Ä (LABORATORY STAFF ONLY) __ (QTY) ☐ Surface Vacuum Dust Initials: 7 297:11 CLIENT CONTACT (QTY) Other (Specify... 1 Contact: Ö Contact Contact: ⊕ phone # ~\(\) 9 _(QTY) DBulk Dust Wipe (wipe type >/ (QTY) (OTY) (OTY) ☐ Denking Water
☐ Waste Water
☐ Dust Wipe Furnace (wipe type. Mold - Direct Microscopic Analysis (QTY) 3 Date/Time: OAK ARMGEL Date/Time: Date/Time: Signature: Cl Spore-Trap
Cl Surface Swab
Cl Surface Tape Sign: D Email Copy: Air Soil/Solid P.O. # Time: Lead Analysis avms 3dVLANNY. Sign: MATRIX DUST WARREN All samples received in good condition uffless otherwise noted. Submittal Information: 1 6 (OTY) (OTY) (OTY) $y_{I \cap I} K$ 013 (CL) _Date: Job Location: ЯIA Submitted by: Contact Perso Reporting Information (Results will be provided @ fax #_ (STS) By (Print): Job#. (OTY) $a_{\gamma_{OIV}}$ ☐ Quan. (s/area) Vacuum D5755-95 (QTY) Quan. (s/area)Dust D6480-99. 🖵 Qual. (pres/abs) Vacuum/Dust. $q_{V_{\overline{d}\gamma}}$ ANALYSIS PCM PLA PA ☐ ELAP 198.2/EPA 100.2 DELAP 198.4/Charfield UNY State PLM/TEM_ Via: (TEM Water samples Qual. (pres/abs). けんぱし・くれかく Residual Ash_ By (Print): G EPA 100.1, N_{HL} Burgan L □ Fax Copy: TEM Water TEM Bulk TEM Dust WIPE AREA (9) くばし Θ VOLUME 3 Fax # 17 (3 3 8 (8) 140 RD アダル DATE U (OTY) OTS) Please include COC/field data sheets with results (Q1X) (QIX) SAMPLE INFORMATION LABORATORY STAFF ONLY: (CUSTODY) Mailing/Billing Information:

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Address 7:	PC MCE Porosity in a 25mm 57mm O'L MCE Porosity in a 25mm 57mm or TEM Air – Please Indicate Filter Type: SAMPLE LOCATION/ IDENTIFICATION 633 (OTX) (QTX) 3. Results Reported To:_ Date/Time Analyzed: 1. Date/Time RCVD: ☐ EPA 600 – Visual Estimate.☐ EPA Point Count.☐ NY State Friable.☐ Grav. Reduction ELAP 198.1☐ Other (specify. Grav. Reduction ELAP 198.1 www.amalab.com O AHERA			
UNIOSH 7402
Other (specify_ 96-5 12 C-C 0000 $Q_{i}Q_{j}$ 70-03 CLIENT ID NUMBER としてい PEST AVAILABLE COPY

4. Comments:

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Page 5246 of 5269

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CHAIN OF CUSTODY

: : : : : : : : : :

white oak IFR

(Please Refer To This Number For Inquires)

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F# 0 2 1 A

Results Rep Comments:	2. Date/Tir	LABORATORY ST. 1. Date/Tir			001-0W		XC) - C)X	80 × 01	901 - OW	800 8	#C1+C8		187-102	010	001 - UNN	CLIENT ID NUMBER	☐ Other (specify	I Gray, Reduction ELAP 198.1	■ EPA Point Count_	TEPA 600 - Visual Estimate	PLM Bulk	NIOSH 7402	→ AHERA	IEM Air - Please Indicate Filter Type:	Ա Մերանին	PC MCE Porosity	Ashestos Analysus PCM Air – Please Indicate Filter Type:	L Verbais:	Date & Time Results Required:	2 Please include COC	Phone #: 👉	4. Address 3:		2. Address 1: (3.)	L. Client Name:	www.amalab.com Mailine/Billine Information
Results Reported To: Comments:	2. Danc/Time Analyzed:/	LABORATORY STAFF ONLY: (CLSTODY) 1. Date-Time RCVD:														SAMPLE LOCATION SAMPLE LOCATION DENTIFICATION DATE DA		(Kr 0)			-	3	(YIV)	Filter Type:		in a 25mm 37mm	: Filter Type:	@ ce)] #	equired: 12 /2 /	2 Please include COC/field data sheets with results	たないことを] 	1 1 No. 1	1 1 0 1 20	2000 x /200	nation:
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	By (Print):	Na ^O IO:														TEAL	Condition of the Control	All samples		⊒ ELAP (98.2/EPA 100.2) ⊐ EPA 100 1	☐ Qual. (pres/abs).	TEM Water Tem Water	Quan. (s/an	Destroyer □ Qual. (press	⊒ Residual A⊾h	NY Sak PLM/TEM_	TEM Bulk	C0 51 :	Immd (E)	romation (0 10 10 10 10 10 10 10 10 10 10 10 10 10					
- Via:	<u>s</u>	, 754 754		-	~-: ~-!					;	 :: :-					PCALAXALYSIS	anipies	XI All samples received in good condition unless otherwise		YEPA 100.2_	<u>\$</u>	L Quan (states) des de 1807/	2 Quan. (s/arca) Vacuum 05755-95	⊒ Qual. (pres/abs) Vacuum/Dust		TWLEN	Air halfield		4hr □48ht	괃	~ 			in		c.
 		By (Print):			<u>`</u>			i	-		-	_			- \	MOLD		ood condition	(ATT)	ļ	 	***	5755-95	Dret.	(QTY)	÷Ι	2	— @ fax#	□r2hr Cs	be provide	Sohmitted by:	Contact Person:	Jah #	Job Location:	I. Joh Name:	mittal for
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Initials:			ŀ				Contact:			Connecti	Contact				Contact	CLENT CONTACT (LABORATORY STAFF ONLY)		- (QTY) □ Other (Specify)_	(QTV) L Subtraction (QTV)		ik ok	(a)	(QTY)	ory (a.g.	3				s* Laze-Night* (*must be pre-schedules) od		7	One #				
		Pos Ma	sted y, 20	to N	١GE]	DIA	Rela	ding	1	om	_ [8 √	BEST	- A\		AB	LE (co	Y			F	글 SIA	Req Rel	lues ease	ischedilled F	Reço / Na	ord tion	#J	15† Gua	00 8 ard I	5 (M Bure of 52	ID) eau

NGB-AVS-SG

SUBJECT: All States (Log Number P01-0075) Army National Guard (ARNG) Safety and Occupational Health Program -- POLICY AND RESPONSIBILITIES FOR INSPECTION, EVALUATION AND OPERATION OF ARMY NATIONAL GUARD INDOOR FIRING RANGES

APPENDIX G SURFACE WIPE SAMPLING SHEET

,	Industrial H	ygiene Sur	face Wipe Sa	imple Sheet	
301-14 Old			Point of Contact Non-Res Samples Collect Non-Respor	ponsive	#) 410-942-0273
	Grace MD 21				<u> </u>
Sampled Facility White Oak	\mathcal{S}_{i}			Location (bldg	
Description of Co	operation ring Range) Da	te Collected 18 July 200	06	Date Shipped 18 July 2006
Analysis Desire	d Lead				,
Sampling Data					
Lab Use Only	Sample #	Results	Remarks		
	W0-32		Right lanc.	at Dullet Trail	ON HOW
	W0-33		mid lanc, and	+ tullet trop	in hoor
	W0-34				y bulled troup and too
	WO-35		right side wa the green	paint B	ft. up.15 sample of ulk.) p where girken
·	MO-36		night side u	vall, 3ft or	Aring the
•	wo-37				
	wo-38				firing line
	WO-34		top of stai	rs, on the	Υ
	wo-40 ·		armmy.		ding to the
	W0-41		just insid	e door to	range, on floor
	WO-42 Alank	-	blank	·	
	WO-43/Hand		blank		
Comments to L	.ab :			, .	4 5
100 cm	2 templat	used.	Ricasc tepo	rt in m	9/H+

AMA Analytical Services, Inc. A Specialized Environmental



) VIVE 4010

Client: National Guard Spreau Job Name:

White Oak Armory (Silver Spring)

Chain Of Custody:

148416

	gu	13	٨	r5	12.00	N;>	* *	Wipe Blank	Flame	WO-43	0667517
	₀ 5	12	٨	gy.	12.00	N/A	E	Wipe Blank	Flame	WO-42	0667516
	rigine.	110	٨	ug/ft?	108.01	0,111	**	Wipe	Flame	WO41	0667515
	ug/ft?	140		ng/ft-	108.01	111.0	* * * *	Wipe	Flame	WO-40	0667514
	uģ/ft²	130		119/ft ²	108.01	111.0	**	Wipe	Flame	WO-39	0667513
	பத/ਜੋ?	140		ug/ft²	108,01	11170	***	Wipe	Flame	₩0-38	0667512
	ug/ft²	950		ng/ft;	108.01	0.111	****	Wipe	Flame	WO-37	0667511
	ng/ft ^s	\$ 4 0		ug∕ît*	108.01	0.111	***	Wipe	Flame	WO-36	0667510
	%P5	0.026		%P5	0.01	NiN	4 2 4 4	Paint Chip	Flame	WQ-35	0667509
	ng/ft²	180		րջ/ft²	108.01	0.111	*	Wipe	Flame	WO-34	0667508
	ng/fi ²	220		og/ft²	108 01	0.111	÷	Wipe	Flance	WO-33	0667507
	n8/tea	260		ນໃຊ້ເ	108.01	111.0	****	Wipe	Flame	WO-32	0667506
				Limit .	, 	(H)	(L)	Section Control	yen is a character of the	Number Number	Number Number
Comments	f.	Final Result		artine	7	Area Wined	Air Volume	Sallah Type	A natively Type	Client Cample	NA COMPT
Page 1 of 2			Lead	is for	Analys	bsorption	of Atomic A	Summary of Atomic Absorption Analysis for Lead			
										Nan-Respo	Attentions
Report Date: 19-Jul-06	7/19/2006	7/15	alyzed:	Date Analyzed:			Not Provided	P.O. Number:			
		Non-Re	Person Submitting:	Person S			Not Provided	Job Number:	rland 21078	Havre de Grace, Maryland 21078	
	7/18/2006	7/18	Date Submitted:	Date Sul			Not Provided	Job Location:	Attn: NGB-AVN-SL nion	301-IH Old Bay Lane, Attn: NGB-AVN-SL State Military Reservation	Address:

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FOIA Requested Record #J-15-0085 (Ma) Released by National Guard Bureau Page 5249 of 5269

AMA Analytical Services, Inc.



A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Address Client: Attention: Havre de Grace, Maryland 21078 301-411 Old Bay Lane, Attn: NGB-AVN-SL Sine Military Reservation National (inard Burem P.O. Number: Job Location: Job Name: Job Number: Not Provided Not Provided White Oak Armory (Silver Spring) Not Provided Date Analyzed: Person Submitting: Date Submitted: Chain Of Custudy: 7/18/2006 7/19/2006 148416 Report Date:

Client Sample Number Analysis Type Sample Type Summary of Atomic Absorption Analysis for Lead Air Volume Area Wiped 3 Reporting

AMA Sample Number

See QC Summary for analytical results of quality control samples Final Result Comments

associated with these samples.

Note: All results have two significant digits. Any additional digits shown Note: All samples were received in good condition unless otherwise noted N/A = Not ApplicableAnalysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7421; Water: SM-3113B Analysis Method for Flame; Air, Wipes, Paints, and Soil/Solids; EPA 600/R-93/200(M)-7420; Water, SM-31118 should not be considered when interpreting the result. %Pb = percent lead by weight mg/Kg = parts per million (ppm) by weight <math>mg/L = parts per million (ppm)ug = micrograms ug/L = parts per billion (ppb)

Air and Wipe results are not corrected for any blank results

Technical Manager:

Analyst:

Enablity for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidefuse, unless otherwise requested by the client, NVLAP, NIST.

4475 Forbes Blvd. • Lanham, MD 20706 • (301) 459-2640 • Toll Free (800) 346-4961 • Fax (301) 459-2643 An AIHA (#8863), NYLAP (# 101143), & New York ELAP (#10920) Accredited Laboratory NVLAP, NIST, or any agency of the Federal Government.

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Requested Record #J-15-0085 (HD)
Released by National Guard Bureau FOIA Requested Record #J-15-0085 Page 5250 of 5269

19-Jul-06

Page 2 of 2

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4. Comments:	3. Results	2. Date/Ti	LABORATORY ST L Date/Ti	MD-43	WD-42	(T - CR	4-ON	128 -OM	28-CM	MD-37	20-0M	%C-0%	1610R	WO-33	ND-32	CLIENTID	U Other (specify	Conv Reduction FLAP 198 1	☐ EPA 600 – Visual Estimate ☐ EPA Point Count	PLM Bulk	Other (specify	O AHERA	TEM Air - Please Indicate Filter Type:	C Fiberglass	PC MCE Porosity_	Asbestos Analysis PCM Air - Please Indicate Filter Type:	□ Verbals:	☐ Please include COC Date & Time Results F	Phone #:	A Address 3:	Address 1:	Client Name:	www.amalab.com Mailine/Billine Inform	4475 Forbes BN (301) 459-2640	AIHA (#100470
nts:	3. Results Reported To:	2. Date/Time Analyzed:/_	LABORATORY STAFF ONLY: (CUSTODY) 1. Date/Time RCVD:/ ' Y 9.	BLANK	BLANK							BIVIX				SAMPLE INFORMATION SAMPLE LOCATION DA IDENTIFICATION DA)	[(QTY)				(QTY)	e Filter Type:	(810)	io a 25mm 37mm	e Filter Type:	@ cell #	Delease include COC/field data sheets with results Date & Time Results Required: 19 /111/1/26	410-942-0273	120 00 0100	7		3	4475 Forbes Blvd. • Lanham, MD 20706 (301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643	AIHA (#100470) NYLAP (#101143-0) NY ELAP (10920)
			700 @ >:+v	<u>ج</u>			-								HX.T. TOWISE	VOLUME	3		00	:	ISSENTINGI BEND III	סכ	ido □ ido □	T NST	O	Mrs Wall	0	Reporting 1330	HE20-242-028+	A. C.	1	Bureau		KO1) 459-2643	Y ELAP (10920)
	ري الله الله الله الله الله الله الله الل	By (Print):	Vie WALK For	4								×	::			TEM / CM / MALYSIS	(TEM Water samples	Alt samples received in good condition unless otherwise noted.	© EPA 100.1	Qual. (pres/shs)	L Water LWater	O Quan. (Marea) Vacuum DS7SS-95	O Qual. (pres/abs) Vacuum/Dust,	Residual Ash	ONY State PLM/TEM	1 Bulk	opy:	Reporting Loformation (Results will be provided as soon as technical 1330 Dimmd. 224hr _148hr _172hr _15 Day + _1mmd. After	 			1. Jo	Cuba	CHAIN O)
	J Date: 7		By (Print):	*	×	×	×	×	×	×	×	×	×	×		MOLD AIR BULK	o 0	d condition unless otherwise	(QTY)	(QTY)	(711)	5-95	UNI (QTY)	_(QTY)	(A1.0)	(ALA)	@ fax #	v: provided as soon as te]72hr □5 Day + □lmm	Submitted by	Jon A:	Job Location:	1. Job Name: Pope C	Shoul Tu Barrayattana	HAIN OF CUSTODY	} [
	10 / C	_ †	N 													OUST MATRIX NATRIX NATRIX NATRIX NATRIX STRAPE STRAPE STRAPE	Ł	e noted. Surface Swah	Mold - Direct Micr Spore-Trap_		□ wasie. □ Dust W				S Dust ≪	Lend Analysis		By feasil Hours*	S	P.O. #:		Car Armon			
	16.						Date/Time:	***************************************			Date/Time:				Date/Time:	/ CLIEN			(Q		Dust Wipe Furnace (wipe type		(017)	(AUD)	W Dust Wipe twipe type 4005			, S.maj	Signature T			CSINCY Spring		Number For loquires)	(Please Refer To This
			7	MARKET AND AND AND AND AND AND AND AND AND AND	The state of the s	TO THE PARTY OF TH	Coolact: By:				Contact: Rv.	NAME OF TAXABLE PARTY O			Contact: Rv.	CLIENT CONTACT (LABORATORY STAFF ONLY)	(Q1x) a Other (specify)	(OTY) Surface Vacuum Dust	ulk(QTY)		. · ·	(QTY)) II (0TY)		(a)	Late-Night* (*must be pre-scheduled)		HO PALATON				1 1	148416
1			Post	NG												BEST	- 2 - 2 - 3	(VTQ)	ΛDI	E C	ODY ODY	~						ctod						. D.\	

APPENDIX F

SURFACE WIPE SAMPLING SHEET

Industrial Hygiene	Surface W	ipe Samp	ole Sheet	
Return Address	Point of Conta Non-Responsive	nct <i>(name &)</i> 410-942-02		
Region North IH 301-IH Old Bay Lane Havre De Grace, MD 21078	Samples Colle Borckman	ected By on-Responsi	ve	
Sampled Facility White Oak Silvers	City Daring	State (Location 1FR	(bldg/area)
Description of Operation Converted IFR	Date Collected 2 Aug 0 (4	Date Shipped	
Analysis Desired Lead	<i>J</i>		J	
Sampling Data				
Location	Sample :	#	Results	Remarks
Byttane (5) at bullet trop on floor	WO - 10	00		
Middle lane (3) at bullet trap on Floor	W0-10	11		
18ft lane (1) at corner neurbullet trup	WO-10	12		
Right will, 3 Pt-up from From From where green paint begins	wo-10	3		
Centerlane (3) 1577 From Firing line	W0~10	4		
leftlane (1) 20 ft from firry line	W019	25		
on floor, just inside range On floor, just inside outer door on floor, just inside range	W0-10	6		
on floor, just inside outer door	1-6W	07		
on floor, just inside range Inner door	WO-10	8		
	WD-10	PC		
BLANK BLANK	WD-1	10		
Comments to Lab:				

Analytical Services, Inc.

Address:

Attention:

CERTIFICATE OF ANALYSIS

A Specialized Environmental Laboratory

Client: National Guard Bureau Job Name:

301-IH Old Bay Lane, Attn: NGB-AVN-SI, Havre de Grace, Maryland 21078 State Military Reservation Summary of Atomic Absorption Analysis for Lead Job Location: P.O. Number: Job Number: Not Provided Not Provided White Oak Armory (Silver Spring MD) Not Provided Person Submitting: Chain Of Custody: Date Analyzed: Date Submitted: 150757 6/21/2006 6/21/2006 Report Date: 2I-Jun-06 Page 1 of 2

AMA Sample (Number
Client Sample A Number
e Client Sample Analysis Type Number
Sample Type
Air Volume Area (L)
Area Wiped (ft²)
Reporting Fi
Final Result
Comments

0659382	0659381	0659380	0659379	0659378	0659377	0659376	0659375	0659374	0659373	0659372	0659371	0659370	0659369	0659368	0659367	0659366	0659365	0659364	0659363
WO-20	WO-19	WO-18	WO-17	WO-16	WO-15	WO-14	WO-13	WO-12	WO-11	WO-10	WO-09	WO-08	WO-07	WO-06	WO-05	WO-04	WO-03	WO-02	WO-0I
Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame
Wipe Blank	Wipe Blank	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe
***	* * *	* * *	**	**	**	**	* * * *	***	***	***	***	***	***	***	***	***	** **	****	***************************************
N/A	N/A	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111
12.00	12.00	108.01	108.01	108.01	108.01	108.01	108.01	108.01	108.01	108.01	108.01	108.01	108.01	108.01	108.01	108.01	108.01	108.01	108.01
<u>8</u>	胀	ug/ft²	ug/ft²	ug/ft²															
٨	٨		٨		٨	٨	٨	٨			٨	٨					٨	٨	٨
12	12	170	110	150	110	110	110	110	260	230	110	110	160	430	190	3700	110	110	110
ug	F6	ug/ft²	ug∕ft²	ug/ft²	ug/ft²	ug/ft²	ug/ft²	ug/ft²	ug/ft²	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 Labor posses, 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 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 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 NVLAP, NIST, or any agency of the Federal Government 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 All rights reserved. AMA Analytical Services, Inc.

WA Analytical Services, Inc.



Address Client

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Requested Record #J-15-00 (MD)
Released by National Guard Bureau
Page 5254 of 5269

Page 5254 of 5269

Havre de Grace, Maryland 21078 State Military Reservation 301-IH Old Bay Lane, Attn: NGB-AVN-SI, National Guard Bureau P.O. Number: Job Location: Job Name: Job Number: Not Provided Not Provided Not Provided White Oak Armory (Silver Spring MD) Date Submitted: Date Analyzed: Person Submitting Chain Of Custody: 6/21/2006 6/21/2006 150757 Report Date: 21-Jun-06

Summary of Atomic Absorption Analysis for Lead

Attention:

AMA Sample Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result Comments Page 2 of 2 Requested Record #J-15-00 Released by National C

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7421; Water: SM-3113B Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B %Pb = percent lead by weight N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm) ug = micrograms ug/L = parts per billion (ppb) associated with these samples. See QC Summary for analytical results of quality control samples

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

BEST AVAILABLE COPY 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:

Technical Manager:

ABLE COPY

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 Laboration protocils are based upon the information provided by the persons submitting them and, unless collection protocils are based upon the information provided by the persons submitting them and, unless collected by persons of this information. Residual sample material will be discarded in any of the federal Government.

NYLAP, NIST, or any agency of the federal Government.



AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 13104

Aunitysis Type:

Flame

Sample Type:

Wipe

Analysis Date:

6/21/2006

Result

Percent

Comment

0.3333

Recovery

Acceptable

Report Limit Verification Sample

-0.015 ppm 0.3027

DD DE

90.8%

Acceptable

Expected Spike Level (ppm)

Hig

Duplicate Sample ! Duplicate Sample 2

Preparation Blank

#Nonf #Numb mg/Kg mg/Kg

#Herror

RPD

#1inter

Matrix Spike Analysis

Spiked Sample

94.86%

Acceptable Acceptable

Spike Duplicate Laboratory Control Sample 1

Laboratory Control Sample 2

290,749

101.15%

0.92%

Acceptable

295,154

100.21%

Acceptable

Calibration Information

Correlation of Calibration Curve:

0.999106

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

150757

\$9363

WO-01

150757

59364

WO-02

SDG Number:

13104

Page 1 of 2

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
150757	59365	WO-03
150757	59366	WO-04
150757	59367	WO-05
150757	59368	₩O-0 6
150757	59369	WO-07
£\$0757	59370	WO-08
150757	59371	WO-09
150757	59372	WO-10
150757	59373	MO-11
150757	59374	WO-12
150757	59375	WO-13
150757	59376	WO-14
150757	59377	WO-15
150757	5937%	WO-16
150757	\$9379	WO-17
150757	59380	VO-18
150757	59381	WO-19
150757	59382	WO-20

SDG Number:

13104

.. Page 2 of 2

NGB-AVS-SG

SUBJECT: All States (Log Number P01-0075) Army National Guard (ARNG) Safety and Occupational Health Program -- POLICY AND RESPONSIBILITIES FOR INSPECTION, EVALUATION AND OPERATION OF ARMY NATIONAL GUARD INDOOR FIRING RANGES

APPENDIX G SURFACE WIPE SAMPLING SHEET

	Industria	al Hygiene Sur	face Wipe Sar	nple Sheet	
Return Addres	10122	ay Lane	Non-Responsi	7,0 /12 04/3	
HAURE C	6 CBACE	ZFOIC ,	Non-Respo	ed By nsive	
Sampled Facili	DAK	Silver Spring	State MD	Location (bldg/area)	
Description of	. FIRING	1.)	te Collected なししにんしし	Date Shipped	
Analysis Desir	ed				
Sampling Data					
Lab Use Only	Sample #	Results		Remarks	
	wa- 1			ge Room phibble	et Sor
	MO-7		BACK STORK	top by 2ry stubs	HAC
	WO-3		777 0700	look by 5ky 2tmp?	
	mo-4		E10001	Specific 1 English 10	
	WO-5		I WN FIGOR	18, Behind Bullet tea	- Ş `s
	wo-6		(A) SER TUNG	ON Ploop corner	بانده
	WO-7		KI SISE OF	exallapped Essent to	wat-
	mo-8		F 1241 95	real solite by inc 24.	445 445
	wo-9				
·	W0-10		ON Floor	TROM FROM PRANGE TROM FROM PINTE JOHN SO FT FROM	
	WO-11		W 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 NOW 30 NA ALOW	
Comments to L	WO-12		CHANGE W	LEANGE DOOR	
	i Mari		•		

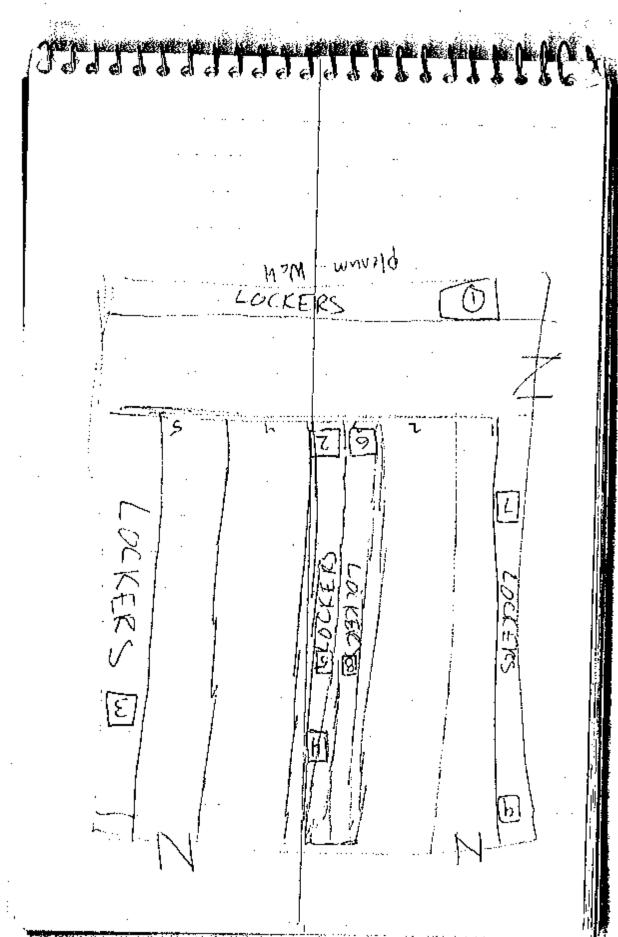
NGB-AVS-SG

SUBJECT: All States (Log Number P01-0075) Army National Guard (ARNG) Safety and Occupational Health Program -- POLICY AND RESPONSIBILITIES FOR INSPECTION, EVALUATION AND OPERATION OF ARMY NATIONAL GUARD INDOOR FIRING RANGES

APPENDIX G SURFACE WIPE SAMPLING SHEET

	Industrial I	lygiene Surf	face Wipe Sar	nple Sheet
	ARNG			(name & phone #)
Return Addres	H OLD BAY	LANC	Non-Responsiv	EFG0-242-0273
HAURE	de Grace	grole am,	Samples Collecte Non-Respon	ad Rv ISIVe
Sampled Facil	•		State	Location (bldg/area)
white O		uer Spring	-L	IFR
Description of	Firing RA		te Collected	Date Shipped
Analysis Desir	ed	1030	3 Jul 06	20 Jun 06
Sampling Data				
Lab Use Only	Sample #	Results		Remarks
	wo-13		OH FROM	Remarks IN TROUT OF DOC
	W-14		I	at bottom of 31
	WO-15		ON Missing	e of lith stain
	wo-16		At top 5	st stairs on blo
	W0-17		031000	16 1500 mg
·	mo-18		OH SICO	EIN FRONT OF AC
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i Lje		locker #	130
	¥ 3	locker,	Row 4, 9 lactors from well
!!		on trep	end, locker # 129
ii i	क्ष	locker	Lows, 5 lockers from well
:: :		f	end, lacker # 080 Mossberger
i. :	8 5	F	20w 3, 10 lockers from well
1		. [and locker 039
•	ò.	' [Pew 2, 153 locker Som plenum
1			oda, 013
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Posted to NGB FOIA Reading Room May, 2018

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 5260 of 5269

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)

36295

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		E	Via:	7		W151					-				-		_	(TEM Water samples°C)	☐ Qual. (pres/abs) ☐ EL,AP 198.2/EPA 100.2	☐ Quan. (s/area)Dust D6480-99 (Water	☐ Qual. (pres/abs) Vacuum/Dust	1 Dust	O NY State PLM/TEM_		ğ	Information (Results will be provided as soc	25			
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			BULK SAM	PLE D	ATA	·	·
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Analysis	s Desired Lead	d Wipe	es - Furna	ce m	ethod	- VI	
Lab Use Only	Sample No.	Cons	tituents		Results		Remarks
····	GALOIXON GOA					Floor Side	- Carpet right near builet t cap sining Room S
	(1000) (1000) (1000)					Floor of floor when	r-coment middle or nearing finingline of locken used to be?
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Commen	ts to Lab		······································				ed on other side)
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Procedur	es Performed	С	omments;		1	-	
	Peeted to NCB FOIA F	Peading Room	BEST AV	AILABLE C	OPY	FOIA Requeste	d Record #J-15-0085 (MD)

BULK SAMPLE DATA

ıb Use Only	Sample . No.	Constituents	Results	0
	G#-093004		1.000118	Remarks
	006		!	OUTSIDE RANGE DOOR by
	G41033009			STAIRS, FlooR
	007	 _		COMPUTER VICTOR BACK
	G9-033004			INTRAINING RM by WALL
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	G-57 CO 3004		<u> </u>	while KDX, low by door
1	013			Plenum wall, Akove lerka
	G.E.L.093004		<u> </u>	<u> </u>
				Rear Wall, truming Rm, left side in middle
	OF CHEODY			left side in middle
[.015			REAR WALL TRUG RU MING
	GELOSOWY			RETRUMING TRUE-RM,
	010	_		RENEWALL TRUE-RM,
ľ	04-093009		 -	Bight sind high
—·—{,	017	· <u></u> _		MI DOLE TRAINING WALL
-1 ^L	2EC03004			TRUG-RECONSIDE MIODIE-
	019 56C03004			MIDDLE TRIKENAL LOCKER
۲	019	-		SIDE AT OF AT OWNER MIC
	25T 013001	<u></u>		Right wall, above ft. locker
Į`	1080			Quality and Locked 1999
- 6	55 C C 300 V			RIGHTWALL LOCKERS, ITEMING WHILE SINGLE PAST 3 LOCKERS IN L
	0.21			Right wall LACKED ROOM
	rel 693004		<u> </u>	Right wall Little Room, Firm Live high
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										WIRE AREA TEM PCM PLM LEAD OTHER AIR BULK WIPE	ANALYSIS MATRIX	7 in: 49/Pt 3	VIOUS (OLK)	Udan. (s/area) Vacuum D5/35-95 (QTY) D Quan. (s/area)Dust D6480-99 (QTY) TEM Water D Onal (mas/abs) (QTY)	(QTY)	State PLM/TEM(QTY)	d(QTY)	Denogram Const. Processor @ ext. 301 GET TEST TOTAL TO	its sali be provided as soon as technically feasib			2. Job Location: S:	Submittal Information: 1. Job Name: White Oak	CHAIN OF CUSTODY	
	Post May		Date/Time: Contact: Ву:	B FC	DIA	Date/Time: Contact: By: do	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	Room	Date/Time: Contact: By:	OTHER (LABORATORY STAFF ONLY)	CLIENT CONTACT	(QTY)	Miscellancous Analysis Radon (OTY)	Waste Water (QTY) Q Dust Wipe Furnace (wipe type Charles Wife.) 26 (QTY)	(QTY)	t Wipe (wipe type)(QIY)	hip (QTY)	LEADER ARECTERORISE LEADER NEW COMMENTS OF DIS-SCHOOL OF D	THE REPORT OF THE PARTY OF THE	Postoryou ii	PO.# 301-677-36.89 Rby	old i	#J-15- al Gas	Number For Inquires) 130319 (MD) and Bureau 64 of 5269	

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CET-033001-033 PT VANK CEC-033001-033	CEL-03004-C)5 CEL-03004-C)10 CEL-03004-C)10 CEL-03004-C)10	AMMA Analytical Services, Inc. AIHA (#8863) NVLAP (#1143) NY ELAP (10920) 4475. Forbes Blvd. Lanham, MD 20706 (301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643 www.analab.com Mailing/Billing Information: 1. Client Name: ATTON Not frake Copy 1 cong 2. Address 1: 301 - I H Old Rep. 1 cong 3. Address 3: Floure do. Crace M D 4. Address 3: Floure Results Refailing Date & Hand Results Results Refailing Date & Hand Results	
		CHAIN OF CUSTODY Submittal Information: 1. Job Name: White Oat 2. Job Location: Silver Sq. 3. Job #: 4. Contact Person 4. Contact Person 5. Submitted by: 5. Submitted by: 5. Submitted by: 6. Contact Person 7. Co	EBS 1-800-552-0317
	Date/Time: Contact: By: NG B FOIA Reading Room	Please Refer To This Number For Inquires) P.O. #@ phone # _3Q/(Signature: Edshing: Signature: Bank: Data Analysis Paint Chip(QTY) Double Wape (wipe type(QTY) Drinking Water(QTY) Drinking Water(QTY) Waste Water(QTY) Drinking Water(QTY) Dother (specify) Miscellameous Analysis Dradon(QTY) CLENT COUNTY WATER(LABORATORY COUNTY Date/Time:(County)	108339 2 1,295 2.10 REV. 11.03

A Specialized Environmental Laboratory nalytical Services, Inc.

CERTIFICATE OF ANALYSIS

Attention:			Address:	Client:	
on-Re		Havre de Grace, Maryland 21078	301-H Old Bay Lane, Atm: NGB-AVN-\$L State Military Reservation	National Guard Bureau	
	P.O. Number:	Job Number:	Job Location:	Job Name:	
	BPA #W912K6-04-A0002	Not Provided	Silver Spring, MD	White Oak	
	Date Analyzed:	Person Submitting:	Date Submitted:	Chain Of Custody:	
	10/12/2004	Non-R	10/1/2004	130319	
				Report Date: 12-Oc	
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Summary of At	
mary of Atomic Absorption Analysis for Lead	
Anglysis for Le	
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Page I of 2	
OIA	Req Rel

	0500412	0500411	0500410	0500409		AMA Sample Number
	GEL 093004 004	GEL 093004 003	GEL 093004 002	GEL 093004 001		Client Sample Number
	Furnace	Furnace	Flame	Furnace	- 14417	Analysis Type
	Wipe	Wipe	Wipe	Wipe		Sample Type
****	****	**	***	**		Air Volume (L)
211	0.111	0.111	0.111	0.111		Arca Wiped (ft*)
10001	135.01 ug/ft²	67.51 ug/ft²	108.01 ug/ft²	5.40 ug/ft [*]		Reporting Limit
050 107/AND	900 ug/ft*	540 ug/ਜ਼ੋ?	2700 ug/fr	36 ug/ft²	THE PROPERTY OF THE PROPERTY O	Final Result Comments
V	AIL	.AВ	LE	со	PY	

Number	"Settlethe"			(;				
OSOOMOO	100 FUOE 60 ISS	Flimace	Wine	****	0.111	5.40	ug/ft³	36	ug/ft²
2500410	CEI 002000 002	France	Wine	***	0.111	108.01	ng/fl=	2700	ug/ft
0500411	GEL 093004 003	Furnace	Wine	***	0.111	67.51	ug/ft²	540	ug/ft²
0500412	GEL 093004 004	Furnace	Wipe	****	0.111	135.01	ug/ft²	900	ug/ff²
0500413	GEL 093004 005	Furnace	Wipe	***	0.111	135.01	ug/ft²	850	ug/ft²
0500414	GEL 093004 006	Flame	Wipe	***	0.111	108.01	ug/ft²	1400	ug/ff²
0500415	GEL 093004 007	Furnace	Wipe	***	0.111	. 2.70	ug/ft²	21	ug/ff ^a
0500416	GEL 093004 008	Furnace	Wipe	****	0.111	33.75	ug/ft²	150	ug/ff=
0500417	GEL 093004 009	Furnace	Wipe	***	0.111	13.50	ug/fr	77	ug/fre
0500418	GEL 093004 010	Furnace	Wipe	***	0.111	67.51	ug/ft²	410	ug/fr²
0500419	GEL 093004 011	Furnace	Wipe Blank	****	N/A	0.30	હ્ય	0.57	56
0500420	GEL 093004 012	Furnace	Wipe	****	0.111	33.75	ug/ft²	140	ug/ft⁴
0500421	GEL 093004 013	Furnace	Wipe	***	0.111	5.40	ug/ft²	38	ug/ft -
0500422	GEL 093004 014	Furnace	Wipe	****	116.0	2.70	ug/ft²	90	ug/ft²
0500423	GEL 093004 015	Furnace	Wipe	****	0.111	2.70	ug/ff ^a	12	ug/fte
0500424	GEL 093004 016	Furnace	Wipe	****	0.111	2.70	იგ/ჩა	4.7	ng/t₽
0500425	GEL 093004 017	Furnace	Wipe	****	0.111	2.70	ug/ft²	5.2	ug/ft²
0500426	GEL 093004 018	Furnace	Wipe	****	0.111	2.70	บยู/โค	5.6	ug/ft²
0500427	GEL 093004 019	Furnace	Wipe	****	0.111	2.70	ນຊູ/ຄືຕ	1.8	ug/ft²
0500428	GEL 093004 020	Furnace	Wipe	***	0.111	5,40	ug/ft²	38	⊔g/ft²

this report is submitted and acceptable 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 end collected or protocots are based upon the convoided 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. NYLAP Accreditation applies only to polarized light microscopy of balk 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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uested Record #J-15-0085 (MD) FO Released by National Guard Bureau Page 5266 of 5269 Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result. Note: All samples were received in good condition unless otherwise noted.

Analyst:

Technical Manager:

%Pb = percent lead by weight

ug = micrograms

ug/L = parts per billion (ppb)

AMA Analytical Services, Inc. A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS



Attention			Address:	Client:	
n:		Havre de Grace, Maryland 21078	301-IH Old Bay Lanc, Atm: NGB-AVN-SI, State Military Reservation	National Guard Bureau	
	P.O. Number:	Job Number:	Job Location:	Job Name:	
	BPA #W912K6-04-A0002	Not Provided	Silver Spring, MD	White Oak	
	Date Analyzed:	Person Submitting:	Date Submitted:	Chain Of Custody:	
	10/12/2004	Non-R	10/1/2004	130319	
				Report Date: 12-Oct-04	
				12-Oct-04	

			Summary	Summary of Atomic Absorption Analysis for I	bsorption A	nalysis for I	Lead	Page 2 of
MA Sample Number	1	Analysis Type	Client Sample Analysis Type Sample Type Number	Air Volume (L)	Area Wiped	Reporting Limit	Final Resuk	Соппенс
	***************************************		1.0 marrows 1.0	- 4 44 44				1 - 40.00 100000000000000000000000000000000
050020	GEI 003004 021 Furnace	Furnace	Wite	***	0.111	67.51 ug/ft ²	260 ug/tr²	

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	ting	Final Resub	suk	Comments
			1. A 2. A 2. A 2. A 2. A 2. A 2. A 2. A						+ 24 41 3 145771171111111111111111111111111111111	1 - 40,40 10,400
0500429	GEL 093004 021	Furnace	Wipe	***	0.111	67.51	ug/ft²	260	ug/fr	
0500430	GEL 093004 022	Furnace	Wipe	****	0.111	2.70	ug/ft²	9	աջ/Զա	
0500431	GEL 093004 023	Furnace	Wipe	****	0.111	5.40	ug/ft²	28	ug/ft ^a	
0500432	GEL 093004 024	Furnace	Wipe	****	0.111	67.51	ng/tt²	440	ug/ft²	
0500433	GEL 093004 025	Furnace	Wipe Blank	****	N/A	0.30	PS.	0.47	S S	
unalysis Method for	Flame: Air, Wipes, I	Paints, and Soit/So	Analysis Method for Flame; Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B	200(M)-7420; Water	: SM-3111B					
nalysis Method For	Furnace: Air, Wipe	es, Paints, and Soil/	Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7421; Water: SM-3113B	93/200(M)-7421; W	/ater: SM-3113B					
N/A = Not Applicable		ts per million (ppm)	mg/Kg = parts per million (ppm) by weight $mg/L = parts per million (ppm)$	parts per million (pp	Ĕ					

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 All rights reserved. AMA Analytical Services, Inc., NYLAP, NYST, or any agency of the Federal Government. 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 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 discious any knowledge and 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 This report applies only to the 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,

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 5267 of 5269

Page 2 of 2

11/28/2005

CERTIFICATE OF ANALYSIS

Client Address: 301-IH Old Boy Lane, Atha NGB-AVN-SI, State Military Reservation Havra de Grace, Maryland 21078 National Guard Bureau Job Number: Job Location: Job Name: Not Provided Silver Spring Armory Silver Spring Lockers

P.O. Number:

Not Provided

Date Analyzed: Person Submitting

1/23/2005

Report Date:

28-Nov-05

Date Submitted:

136295 11/21/2005

Chain Of Custody:

Summa

Actention:

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Air Volume	ry of Atomic !
Area Wiped	oic Absorption Analysis for Lead
Reporting	nalysis for
Final Result	Lead
Сопискани	Page 1 uf 2
F	OIA Re

	AMA Sample Number	Client Sumple Number	Analysis Type	Sample Type	Air Volume	Ares Wiped (ff)	Reporting Limit	First Result	Совители
- 1	0609957	20051118SILOIA	Fureacc	Wipe	****	0.111	67.51 ug/82	360 up/ff	
	2500050	100 EN 118811 (118)	Furnace	Wine	***	0.13		2800 ug/ti³	
-4	6565090	20051118SIL02A	Funace	Wipe	****	0,111	13.50 mg/li	ஆற்ற 69	
Л	0905960	20051118511.028	Furnace	₩ipe	****	0.113	67.51 ag/tt²	360 ug/R²	
All I	1966090	20051118SIL03A	Furnace	Wipe	2364	0.11.1	1	35 49/11	
Av	0609962	20051118SIL03B	नगणमान्	Wipe		1110	67.51 ug/ft²	-UF- 055	Appendix of the second
٠,	2966090	20051118SIL04A	Figurate	Wipc	2,042	0.117			

AEROSOL MONITORING & ANALYSIS > 14109420254

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An Alifa (#8863), NVLAP (# 101143), & New York ELAP (#10920) Accredited Laboratury 4475 Forbes Bivd. • Lanham, MD 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (301) 459-2643

May, 2018

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equested Record #J-15-0085 (MD) Released by National Guard Bureau Page 5268 of 5269 11:55

%Pb = percent lead by weight N/A = Not Applicable

ng = micrograms

Analysis Method For Furnace: Air, Wilpes, Paints, and ScillSolids: EPA 600/R-93/200/M)-7421; Water: SM-31138

associated with these samples.

mgR(g = parts per million (ppm) by weight <math>mgR = parts per million (ppm)

ug/L = parts per billion (ppb)

Address: Client

CERTIFICATE OF ANALYSIS

	P.O. Number:	Not Provided	Date Analyzed:
301-IH Old Bay Lane, Attn: NGB AVN-SI, State Military Reservation Linear de Corea Mandand 21078	Job Location:	Silver Spring Armory	Bate Submitted
Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting
	P.O. Number:	Not Provided	Date Analy

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Atomic
Absorption
Anal
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of quality control samples	fical results of qualit	See QC Summary for analytical results of quality control samples	SM-31118	/200(M)-7420; Wafe	ids: EPA 600/R-93	Paints and Soll/So	Analysis Method for Flame: Air Wines, Paints, and Soll/Solids: EPA 500/R-93/200/M-7420; Water, SM-31118	Analysis Method f
Сошмене	Emal Result	Reporting Limit	Area Wiped	Air Volume (L)	Analysis Type Sample Type	Analysis Type	Cigat Sample Number	AMA Sample
Page 2 of 2		Summary of Atomic Absorption Analysis for Lead	Absorption	of Atomic	Summary			

should not be considered when interpreting the result

Note: All results have two significant digits. Any additional digits shown Note: All samples were received in good condition unless otherwise noted.

Air and Wipe results are not corrected for any blank results

Technical Manager:

This report applies only to the sample, or samples, lowestigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a matural protection to extends, the public and these Laboratories, to this report is submitted and accepted for the exclusive ones to whom it is addressed upon the condition that it is not to be used, in whole or in part, in any advertising protection growers without price without protection and price without and the matural protection of the condition of apparently to goodwards. As a matural protection there is absorberized to the report is submitted and accordance of the condition of the public and these collected by the persons admitting them and, unless collected to be a public and these collected by the public and the condition of the condition of the collected of th

applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report ment not be NYLAP, NIST, or any agency of the Federal Government.

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11/23/2005

Report Date:

28-Nov-05