APPENDICES

Appendix A *Shop Diagram*

Appendix B *Lead Sample Results*

Appendix C *Photographs*

Appendix D *References*

July 13, 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
Glen Burnie 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 Glen Burnie Army National Guard Readiness Center located at 14 Dorsey Road in Glen Burnie, 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 Jeff Walworth on May 10, 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 Glen Burnie Readiness Center is an Army National Guard armory comprised of offices, an assembly/drill hall, a kitchen, a fitness room, and a lounge. The point of contact for this facility was Sgt. Klingelhofer. Three (3) full-time administrative personnel are employed in the approximately 20,050 ft² facility. A shop diagram depicting the locations of the operations identified during this industrial hygiene evaluation is attached to this report as Appendix A.

The National Guard Bureau Region North Industrial Hygiene Office provided governmental furnished equipment and sampling media required to perform the industrial hygiene evaluation. Chain of custody forms for laboratories approved by the National Guard Bureau Region North Industrial Hygiene Office were provided with the sampling media. All samples collected during this industrial hygiene evaluation were sent to the National Guard Bureau Region North Industrial Hygiene Office approved laboratories for analysis.

2.0 – LEAD SAMPLING

2.1 – Lead Wipe Sampling

Lead wipe sampling was performed according to the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame). Fourteen (14) 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 – Glen Burnie Readiness Center
Lead Wipe Sample Results

Sample #	Sample Date	Sample Location	Sample Area (ft^2)	Sample Result ($\mu g/ft^2$)
GB-W-1	5-10-10	Field Blank	---	< 12
GB-W-2	5-10-10	Drill/Assembly hall, SE corner, on top of circuit breaker box	0.111	140
GB-W-3	5-10-10	Drill/Assembly hall, east side, top of storage cabinet	0.111	< 110
GB-W-4	5-10-10	Drill/Assembly hall, north wall, top of ceramic tile ledge	0.111	290
GB-W-5	5-10-10	Drill/Assembly hall, north corner, on floor	0.111	< 110
GB-W-6	5-10-10	Drill/Assembly hall, SW corner, on floor	0.111	< 110
GB-W-7	5-10-10	Kitchen (Rm 105), on prep table	0.111	< 110
GB-W-8	5-10-10	Room 121, NE wall, northern unit ventilator air grill	0.111	< 110
GB-W-9	5-10-10	Room 107, on top of bar table	0.111	< 110
GB-W-10	5-10-10	Room 108, top surface of end table	0.111	< 110
GB-W-11	5-10-10	Room 122 (north side – fitness room), north side, top of television	0.111	< 110
GB-W-12	5-10-10	Room 122 (south side – conf. room), table surface	0.111	< 110
GB-W-13	5-10-10	Room 201, top of file cabinet	0.111	< 110
GB-W-14	5-10-10	Top of stairs to 2nd floor, on ceramic tiles	0.111	< 110
GB-W-15	5-10-10	Commander's office (Rm 206 on floor plan), desk surface	0.111	< 110

Surface cleanliness threshold = < 200 $\mu g/ft^2$

2.2 – Lead Air Sampling

The purpose of lead air monitoring was to document task-specific activities and corresponding exposures to lead. Occupational Safety and Health Administration (OSHA) 29 CFR 1926.62 requires employers whose employees are exposed to lead in the work place, in any quantity, make a determination whether any employee's exposure exceeds the action level (AL) of 30 $\mu g/m^3$ or the maximum permissible exposure limit (PEL) of 50 $\mu g/m^3$ as 8-hour time weighted averages (TWAs). If employee exposures are less than 30 $\mu g/m^3$, training is required under the Hazard Communication 29 CFR 1926.59. Exposures that exceed the AL or PEL require the employer to comply with additional

requirements, including air monitoring, additional training, and restricted work practices as outlined in OSHA 29 CFR 1926.62.
Representative fixed area sampling was conducted for potential airborne concentrations of lead in accordance with accepted Industrial Hygiene methods recognized by the National Institute for Occupational Safety and Health (NIOSH) and OSHA. Representative breathing zone samples were not collected from an employee performing administrative tasks. Any employees performing a specific task utilized the same work practices. Employees not monitored for exposure to airborne lead dust can assume to have the same exposure as the monitored employees performing the same task.

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 – Glen Burnie Readiness Center Lead Air Sample Results									
Sample #	**Sample Type**	**Sample Location**	**Flow Rate**	**Start**	**Stop**	**Vol.**	**Rpt. Limit ($\mu g/m^3$)**	**Results ($\mu g/m^3$)**	**8 hr TWA ($\mu g/m^3$)**
May 10, 2010									
GB-A-1	FB	Field Blank	---	---	---	0	3	< 3	N/A
GB-A-2	IWA	Room 121, on Sgt. [redacted]s desk, east side of room	2.0	0856	1514	756	4	< 4	N/A
GB-A-3	IWA	Room 122 (south end – conf room), center of room, on table	2.0	0903	1515	744	4	< 4	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 Glen Burnie Readiness Center, Bonus Environmental, LLC performed a visual inspection of the facility in regards to lead based paint. Bonus Environmental, LLC identified several areas of peeling paint which could potentially pose a lead exposure hazard. These areas include the ceilings of room 107, Kitchen (room 105), room 201, and lesser localized damage in many rooms. Two (2) bulk sample paint chips were collected from the ceilings of rooms 107 and 201. The paint chip samples were 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 samples contained detectable levels of lead. The paints are therefore considered to be lead based paint and all activities that involve lead based paints are regulated by OSHA Lead in Construction Standard, 29 CFR 1926.62. The OSHA Lead in Construction Standard does not assign a numerical value of which must be present within the paint to be considered lead based paint. Paints which contain any detectable level of lead shall be treated and handled as lead based paint. HUD defines lead based paint as having greater than 0.5% lead by weight. The paint chip samples collected during this industrial hygiene evaluation did not contain lead in excess of 0.5% by weight. Analytical results are attached to this report as Appendix B.

3.2 – Presumed Asbestos Containing Materials
During the industrial hygiene evaluation of the Army National Guard Glen Burnie Readiness Center, Bonus Environmental, LLC performed a visual inspection to identify presumed asbestos containing materials (PACM) and, if found, to note their condition. Bonus Environmental, LLC did not identify any PACM that was considered to be in poor or damaged condition.

3.3 - Water Damage/Mold Growth
During the industrial hygiene evaluation of the Army National Guard Glen Burnie 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-damaged building materials were noted on the plaster walls and/or ceilings in the Kitchen (room 105), room 107, and on the block walls in room 201. It was reported to Bonus Environmental, LLC that mold growth on the shower ceramic tiles is a recurring event.

3.4 - Housekeeping
During the industrial hygiene evaluation of the Army National Guard Glen Burnie 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 Glen Burnie Readiness Center, Bonus Environmental, LLC performed interviews and made observations to determine if the work activities being performed possessed any ergonomic concerns. Following the interviews and observations, no ergonomic and or indoor air quality concerns were identified, although Sgt. Klingelhofer did express concerns regarding the drinking water in the facility.

3.6 – Indoor Air Quality
During the industrial hygiene evaluation of the Army National Guard Glen Burnie Readiness Center, Bonus Environmental, LLC measured temperature, relative humidity, carbon monoxide (CO), and carbon dioxide (CO_2) throughout the facility. A calibrated TSI Q-Trak Model 7565 Indoor Air Quality Monitor equipped with a Q-Trak Probe 982 was utilized to record indoor air quality measurements.

Carbon dioxide is a natural component of air and the amount of CO_2 in a given air sample is commonly expressed as parts per million (ppm). The outdoor air in most locations contains about 380 ppm carbon dioxide. Higher outdoor CO_2 concentrations can be found near vehicle traffic areas, industry and sources of combustion. The concentrations of CO_2 found in most offices are well below the OSHA Permissible Exposure Limit (PEL) of 5,000 ppm when averaged over an 8-hour time period for an industrial workplace. While levels below 5,000 ppm are considered to pose no serious health threat, studies have indicated that individuals in offices with elevated CO_2 concentrations tend to report drowsiness, lethargy and a general sense that the air is stale. Ventilation rates for office spaces are defined by various codes and standards. The most widely accepted standard is the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 62. According to ASHRAE Standard 62.1-2007, CO_2 concentrations below 700 ppm above the outdoor level are considered to indicate adequate ventilation and provide human comfort. The CO_2 measurements collected during this industrial hygiene evaluation ranged from 404 ppm to 481 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 0.2 ppm to 1.3 ppm. CO levels were well below the OSHA PEL during this industrial hygiene evaluation.

During the industrial hygiene evaluation of the Army National Guard Glen Burnie Readiness Center, Bonus Environmental, LLC collected temperature measurements. Temperature measurements throughout the facility ranged from 64.3ºF to 72.0ºF and are considered to be within an acceptable range.

During the industrial hygiene evaluation of the Army National Guard Glen Burnie Readiness Center, Bonus Environmental, LLC collected relative humidity measurements. Relative humidity measurements throughout the facility ranged from 25.2% to 33.0% and are considered to be within an acceptable range. Indoor air quality measurements recorded during this industrial hygiene evaluation are summarized in the table below.

Army National Guard – Glen Burnie Readiness Center
Indoor Air Quality Measurements

Location	*CO_2 (ppm)*	*CO (ppm)*	*Relative Humidity (%)*	*Temperature (ºF)*
Outdoors, west side of building	379	1.5	24.7	60.3
Room 105 (Kitchen)	481	0.7	31.7	64.3
Room 107 (Clubhouse)	462	0.3	33.0	66.4
Room 114	445	0.2	32.2	70.9
Room 118	463	0.4	31.3	71.4
Room 121	441	0.5	30.7	72.0

Army National Guard – Glen Burnie Readiness Center Indoor Air Quality Measurements				
Location	*CO_2 (ppm)*	*CO (ppm)*	*Relative Humidity (%)*	*Temperature (ºF)*
Room 101 (center of Drill hall)	433	1.1	29.2	70.2
Room 122 (north side – fitness room)	404	1.0	31.4	69.7
Room 204	473	1.3	26.4	69.4
Room 206 (room 204 on floor plan)	434	1.0	26.8	69.8
Commander's office (room 206 on floor plan)	412	0.8	25.2	70.3

Required/Recommended Values
CO_2 *- OSHA PEL = 5,000 ppm and ASHRAE Standard 62.1-2007 = no greater than 700 ppm above outdoor*
CO *- OSHA PEL = 50 ppm and OSHA Ceiling Limit = 200 ppm*
Temperature *- ASHRAE Standard 55-2004 = between approximately 67 and 82 °F.*
RH *– ANSI/ASHRAE Standard 62.1-2007 = <65%*

4.0 – LIGHTING

Utilizing a properly calibrated Cooke Corporation cal-Light 400 light meter, Bonus Environmental, LLC collected illumination readings throughout the facility. Illumination measurements recorded during this industrial hygiene evaluation are summarized in the table below.

Army National Guard – Glen Burnie Readiness Center Lighting Survey			
Location	*Measurement in Foot Candles*	*Requirement in Foot Candles*	*Requirement Met?*
Rooms 103, 103A, 103B, 103C	Inaccessible		
Rm. 104	Inaccessible		
Room 111	Inaccessible		
Room 116	Inaccessible		
Room 115	Inaccessible		
Room 119	Inaccessible		
Room 109	Inaccessible		
Room 203	Inaccessible		
Room 102 – Storage garage (1 of 4 bulbs burned out)	4.3	30	NO
Room 105 – Kitchen	19.2	10	YES
Room 106 – Furnace room	27.3	30	NO
Room 107 – Clubhouse	2.7	30	NO
Room 108 – Lobby	10.9	5	YES
Room 112 – Restroom (room 113 on floor plan)	68.7	5	YES
Room 113 – Closet (room 112 on floor plan)	63.6	30	YES
Room 114 – Office	106.8	50	YES
Room 118 – Office	51.7	50	YES
Room 117 – Restroom	12.2	5	NO
Hallway outside of room 117	11.4	5	YES
Room 121 – Office	32.0	50	NO
Room 101 – Drill hall	4.2	30	NO
Room 122, north end – Fitness room	17.0	30	NO
Room 122, south end – Conf. room	109.8	30	YES

Army National Guard – Glen Burnie Readiness Center Lighting Survey			
Location	*Measurement in Foot Candles*	*Requirement in Foot Candles*	*Requirement Met?*
Room 201 – Storage	38.7	30	YES
Room 205 – Office (room 202 on floor plan)	53.8	50	YES
Room 206 – Restroom & showers (room 204 on floor plan)	36.9	5	YES
Hallway outside of room 206	15.6	5	YES
Room 209 – Office (room 207 on floor plan)	89.1	50	YES
Commander’s office (room 206 on floor plan)	11.5	50	NO

Lighting levels were compared to the levels outlined within the ANSI/IESNA RP-1-04 Office Lighting Handbook, and the ANSI/IESI RP-7-01 Lighting Industrial Facilities Handbook. Areas within the facility which did not meet the foot candle requirements are identified with a “NO” within the Requirement Met? column. It is recommended that illumination be improved in all the areas that did not meet the requirements. Improving illumination can be achieved by replacing burned-out lamps/bulbs, cleaning fixtures, relocating detailed work activities to more illuminated areas, and using supplemental task lighting.

5.0 - CONCLUSION

Bonus Environmental, LLC was contracted by the National Guard Bureau Region North to identify and measure the existence and extent of potentially hazardous operations or conditions at the Glen Burnie Army National Guard Readiness Center located at 14 Dorsey Road in Glen Burnie, Maryland. The purpose of this evaluation was to generate or to update a previous baseline evaluation so that employee exposure history can be provided to each civilian and military employee. An industrial hygiene evaluation of the facility was performed by Bonus Environmental, LLC representative Jeff Walworth on May 10, 2010:

Bonus Environmental, LLC recommends that any areas of concerns outlined within this report be evaluated to ensure the necessary actions are made. Following the completion of the industrial hygiene evaluation, Bonus Environmental, LLC found the following safety and/or indoor air quality conditions of the facility to be within acceptable levels/condition in regards to the following:

- Carbon Dioxide
- Carbon Monoxide
- Presumed Asbestos Containing Materials
- Ergonomics
- Temperature
- Relative Humidity
- Housekeeping

Air sampling was not conducted during this industrial hygiene evaluation for metal welding fumes, as this task was not performed during this industrial hygiene evaluation. It is recommended that air sampling be performed during the next scheduled industrial hygiene evaluation for metal welding fumes if welding activities are conducted within this facility.

It has been a pleasure to be of assistance to you. Please contact us if you have any questions concerning this report or if we can be of any further assistance in any other environmental or occupational health matter.

Sincerely,

Non-Responsive [redacted]
Principal
Bonus Environmental, LLC

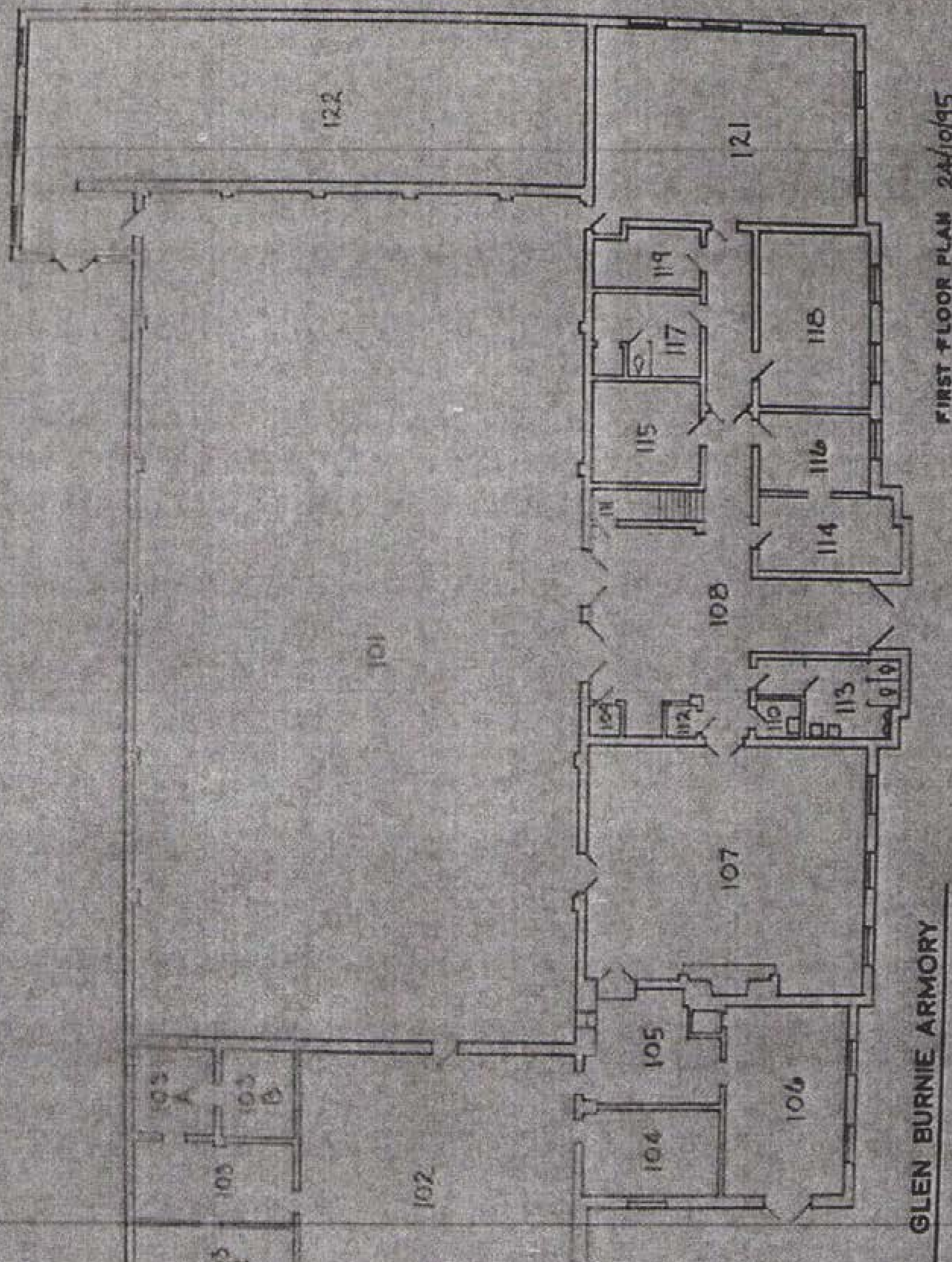
Non-Responsive [redacted]
Principal
Bonus Environmental, LLC

Bonus Environmental, LLC ***P.O. Box 121*** ***Mt. Pleasant, MI 48804***
Work 989-779-7686 ***Fax 989-779-7689*** ***www.bonusenvironmental.com***

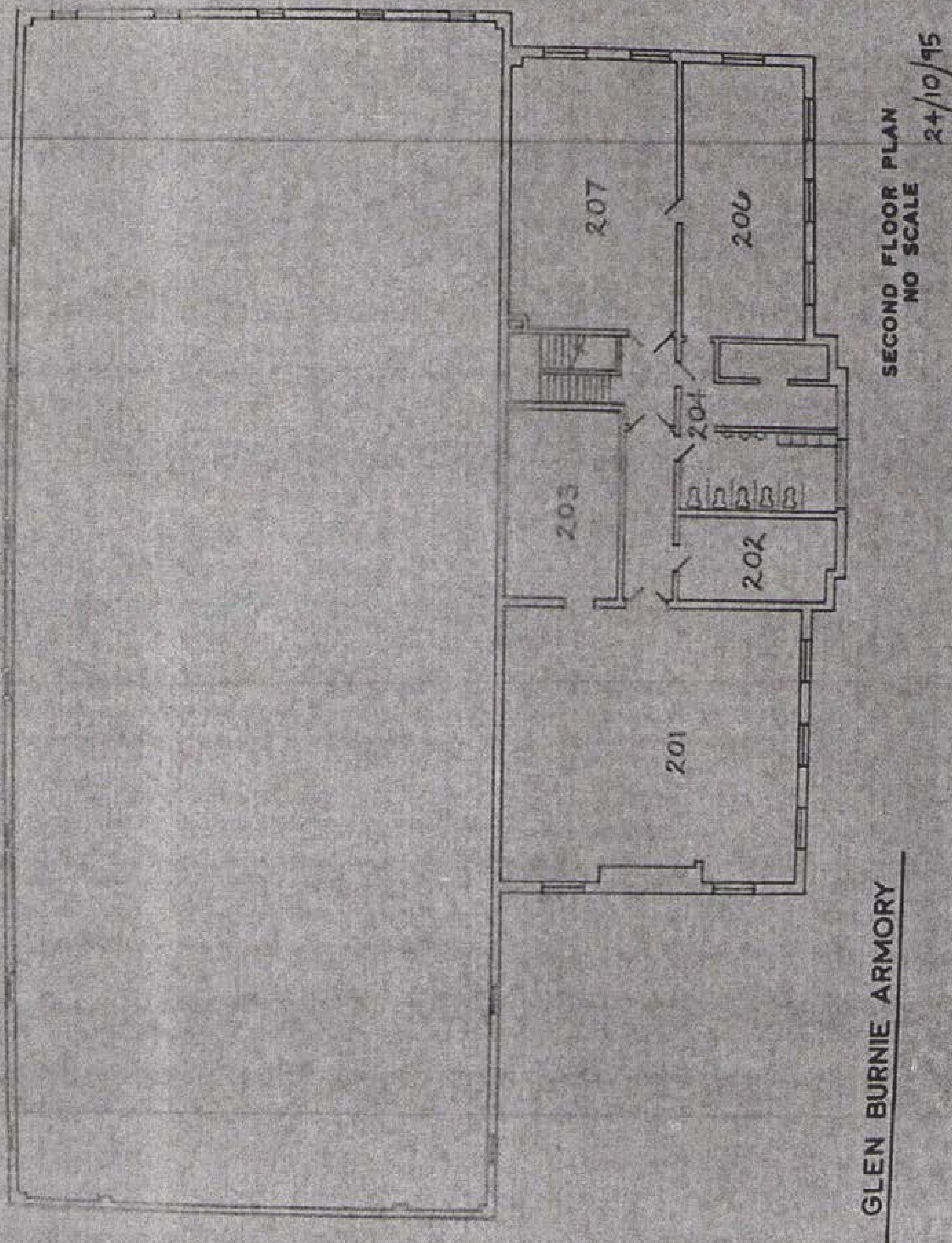
Appendix A

Shop Diagram

BEST AVAILABLE COPY



BEST AVAILABLE COPY



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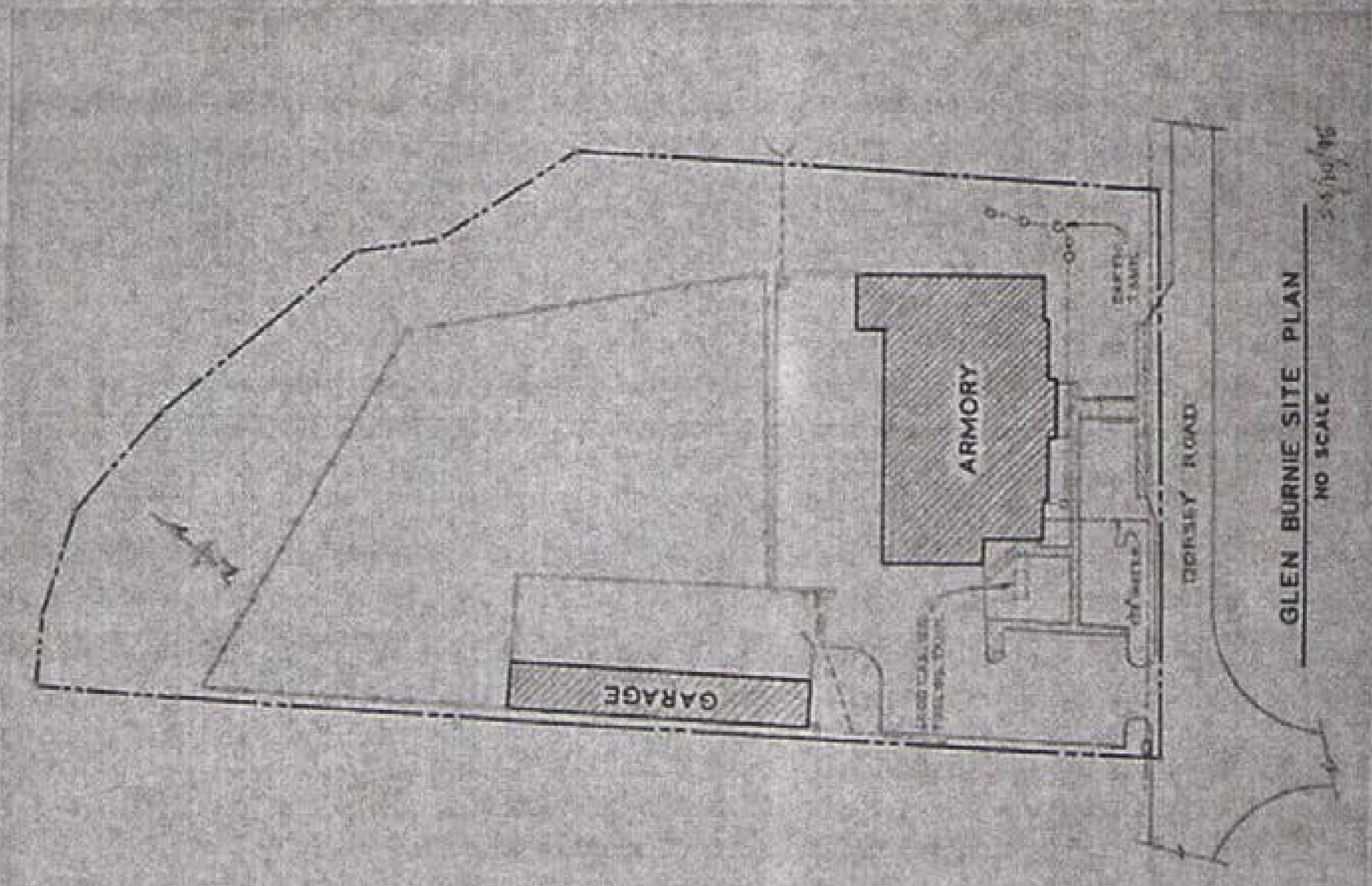

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Appendix B

Lead Sample Results

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCREDITED LABORATORY AIHA Environmental Lead See aihalqap.org for details

100470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Glen Burnie Armory	**Chain Of Custody:**	507101
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Glen Burnie, MD	**Date Submitted:**	5/11/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Glen Burnie Armory	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	5/18/2010 **Report Date:** 5/19/2010

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
1045995	GB-A-1	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1045996	GB-A-2	Flame	Air	756	N/A	4	ug/m³	<3	<4	ug/m³	
1045997	GB-A-3	Flame	Air	744	N/A	4	ug/m³	<3	<4	ug/m³	
1045998	GB-PC-1	Flame	Paint Chip	****	N/A	0.0085	%Pb		0.034	%Pb	
1045999	GB-PC-2	Flame	Paint Chip	****	N/A	0.009	%Pb		0.093	%Pb	
1046000	GB-W-1	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
1046001	GB-W-2	Flame	Wipe	****	0.111	110	ug/ft²	15	140	ug/ft²	
1046002	GB-W-3	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1046003	GB-W-4	Flame	Wipe	****	0.111	110	ug/ft²	33	290	ug/ft²	
1046004	GB-W-5	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1046005	GB-W-6	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1046006	GB-W-7	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1046007	GB-W-8	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1046008	GB-W-9	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1046009	GB-W-10	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1046010	GB-W-11	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1046011	GB-W-12	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1046012	GB-W-13	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1046013	GB-W-14	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCREDITED LABORATORY AIHA Environmental Lead See aihaiqap.org for details

100470

NY ELAP

10920

Client:	National Guard Bureau	**Job Name:**	Glen Burnie Armory	**Chain Of Custody:**	507101		
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Glen Burnie, MD	**Date Submitted:**	5/11/2010		
	Havre de Grace, Maryland 21078	**Job Number:**	Glen Burnie Armory	**Person Submitting:**	[redacted]		
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	5/18/2010	**Report Date:**	5/19/2010

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments
1046014	GB-W-15	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	

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

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

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

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

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

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

Air and Wipe results are not corrected for any blank results

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

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

NY ELAP accreditation applies only to paint chip, wipe, and soil samples.

Analyst: Nida McGarvey

Technical Manager: G Edward Carney

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

Sheet 1 of 2

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 507101

Page 1/2

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

Submittal Information:
1. Job Name: Glen Burnie Armory
2. Job Location: Glen Burnie, MD
3. Job #: Glen Burnie Armory PO #: W912K6-09-A-0003
4. Contact Pers[redacted] @ phone # (410) 942-0273
5. Submitted by[redacted]gnature: [redacted]

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

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ____ ☐ 24 Hours Time Due: ____ Comments: ____	☐ Immediate ☐ 3 Day ☐ Next Day ☒ 5 Day + ☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate) ☐ 2 Day Date Due: 5-18-10	☒ Inclu[redacted]th Report ☒ Ema[redacted]bonusenvironmental.com ☐ Fax: [redacted]us.army.mil ☐ Verb[redacted]us.army.mil

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

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

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

Metals Analysis
☒ Pb Paint Chip 2 (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 15 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

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

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT
GB-A-1	Field Blank	5-10	0	—				*		*							Date/Time: Contact: By:
GB-A-2	Sgt Klingelhofer		756	—				*		*							
GB-A-3	Rm 122		744	—				*		*							
GB-PC-1	Rm 107 Ceiling		—	—				*			*						
GB-PC-2	Rm 201 Ceiling		—	—				*			*						Date/Time: Contact: By:
GB-W-1	Field Blank		—	—				*				*					
GB-W-2	Drill Hall		—	4"x4"				*				*					
GB-W-3	Drill Hall		—					*				*					
GB-W-4	Drill Hall		—					*				*					Date/Time: Contact: By:
GB-W-5	Drill Hall		—					*				*					
GB-W-6	Drill Hall		—					*				*					
GB-W-7	Kitchen		—					*				*					

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 5 / 11 / 10 @ 9:25 Via: FedEx By (Print): Sarah Watson Sign: [signature]
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ____ / ____ / ____ Time: ____ Initials: ____
4. Comments: ____

OW (410) 247-2024

159202 210 REV. 6.08

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

Sheet 2 of 2

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

507101

page 2/2

Mailing/Billing Information:

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

Submittal Information:

1. Job Name: Glen Burnie Armory
2. Job Location: Glen Burnie, MD
3. Job #: Glen Burnie Armory PO #: W912K6-09-A-0003
4. Contact Perso Non-Responsive [redacted] @ phone #. (410) 942-0273
5. Submitted by: [redacted] Signature: Non-Responsive [redacted]

Reporting Information (Results will be provided [redacted]

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS			REPORT TO:
☐ Immediate Date Due:	☐ Immediate	☐ 3 Day	☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)	☒ Incl Non-Responsive [redacted] with Report
☐ 24 Hours Time Due:	☐ Next Day	☒ 5 Day +		☒ Ema [redacted] @ bonus environmental.com
Comments:	☐ 2 Day	Date Due: 5-18-10		☐ Fax: [redacted] @us.army.mil
				☐ Verb [redacted] @us.army.mil

Asbestos Analysis

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

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

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

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

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

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

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

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

Metals Analysis
- ☒ Pb Paint Chip 2 (QTY)
- ☒ Pb Dust Wipe (wipe type Ghost) 15 (QTY)
- ☒ Pb Air 3 (QTY)
- ☐ Pb Soil/Solid ____ (QTY)
- ☐ Pb TCLP ____ (QTY)
- ☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis

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

SAMPLE INFORMATION — **ANALYSIS** — **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
GB-W-8	SGt E's office	5-10	–	4"x4"				X				X				
GB-W-9	Rm 107		–					X				X				
GB-W-10	Rm 108		–					X				X				
GB-W-11	Rm 122 Fitness Rm		–					X				X				
GB-W-12	Rm 122 Conf. Rm		–					X				X				
GB-W-13	Rm 201		–					X				X				
GB-W-14	Top of Stairs		–					X				X				
GB-W-15	Commanders office	↓	–	↓				X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:

LABORATORY STAFF ONLY: (CUSTODY)

1. Date/Time RCVD: 5 / 11 / 10 @ 9:25 Via: FedEx By (Print): Surat Watson Sign: [signature]
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ____ / ____ / ____ Time: ____ Initials: ____
4. Comments: ____

Appendix C

Photographs

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Site street sign


Building Exterior from the southeast


Peeling lead based paint in kitchen


Rm. 107 (clubhouse), peeling lead based paint on ceiling


Rm. 201, peeling lead based paint on ceiling


Rm. 201, water damaged block wall

Appendix D

References

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1. Department of Defense Instruction (0001) 6055.1, Department of Defense Occupational Safety and Health (OS H) Program, August 19, 1998.

2. Army Regulation (AR) 11-34, The Army Respiratory Protection Program, February 15, 1990.

3. DA PAM 40-503, Medical Service, Industrial Hygiene Program, October 30, 2000.

4. Technical Manual (T.M) 5-810-1, Mechanical Design, Heating, Ventilation, and Air Conditioning, June 1991.

5. Threshold Limit Values (TLVs) and Biological Exposure Indices (BEls), American Conference of Governmental Industrial Hygienists (ACGIH), current edition.

6. Industrial Ventilation - A Manual of Recommended Practices, American Conference of Governmental Industrial Hygienists (ACGIH), current edition.

7. UFC 3-410-01 FA Heating, Ventilating, and Air Conditioning, 15 May 2003

8. Occupational Safety and Health Administration (OSHA) Lead in Construction Standard, 29 CFR 1926.62

9. OSHA Lead Standard 29 CFR 1910.1025

10. OSHA Respiratory Protection Standard 29 CFR 1910.134

11. Army Regulation (AR) 385-10, The Army Safety Program, August 23, 2007.

12. RP-1-2004, Office Lighting, Illuminating Engineering Society of North America (IESNA)/ANSI.

13. RP-7-2001, Industrial Lighting, (IESNA)/ANSI.

14. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Standard 62.1-2007, "Ventilation for Acceptable Indoor Air Quality".

15. ASHRAE Standard 55-2004 – "Thermal Environmental Conditions for Human Occupancy"

16. Title 24, CFR, Part 35, Subpart B, Sections 35.110, Definitions of Lead-Based Paint, Housing and Urban Development, U.S. Department of Housing.

17. OSHA Personal Protective Equipment 29 CFR 1910.132

18. OSHA Permissible Exposure Limit (PEL) for General Industry 29 CFR 1910.1000 Z-1 Table

19. Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Department of Health and Mental Hygiene, November 2008.

20. Mold Remediation in Schools and Commercial Buildings, U.S. Environmental Protection Agency, March 2001

21. Army Facilities Management Information Document on Mold Remediation Issues TG277, February 2002

22. OSHA Welding, Cutting, Brazing 29 CFR 1910.252

COMPLIANCE MANAGEMENT INTERNATIONAL

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Industrial Hygiene Survey Report

National Guard Facility
Glen Burnie Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Glen Burnie Readiness Center** **14 Dorsey Road** **Glen Burnie, MD 21061**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**July 25, 2013**
Report Date:	**September 3, 2013**

Non-Responsive
[redacted]

Senior Industrial Hygienist

Table of Contents

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on July 25, 2013, at the Glen Burnie Readiness Center located at 14 Dorsey Road, Glen Burnie, MD 21061. The survey was performed by Mr. [redacted].

1. Lead surface and air samples were collected. Sample results were below recommended guidelines and/or regulator standards. See Section 3.0 for detailed sampling results.

2. Lighting levels did not meet the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in two locations measured. See Section 4.0 for detailed findings.

3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.

    a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in the areas sampled.

    b. The relative humidity levels meet the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in the 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 (CO_2) levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings.

    See Section 5.0 for detailed sampling results.

4. Suspect asbestos containing materials (ACM) 9”X9” floor tile and pipe insulation were observed to be intact and in good condition. See Section 6.0 for detailed findings.

Section 2.0 Operation Description & Observations

The Glen Burnie Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, and a converted firing range area (currently a classroom). There were approximately 5 full-time employees stationed at this facility at the time of this survey. There is no maintenance personnel assigned to the building.

The 20,050 square foot building is reported to have been built in 1954. It is a two story structure. There was an attached single bay garage at the facility that is no longer used for vehicle maintenance. A large vault had been installed in the garage with the remainder of the garage used as storage. The exterior is brick and block. The interior walls are block, plaster and drywall. The floors are concrete, 12”x12” floor tiles, wood, concrete and carpet.

The heating system is oil forced hot water unit. There were portable and unit ventilator air conditioning in some areas.

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 classroom.

Suspect asbestos containing material (ACM) 9”X9” floor tile and pipe insulation was observed to be intact and in good condition.

Chipped and peeling paint was observed in the kitchen and in the wall locker storage room. The peeling paint was on the ceiling in both locations.

Housekeeping is adequate.

It was reported that the building had a new roof installed about a year ago. It was reported that a current roof leak is located on one side of the garage door.

Section 3.0 Lead Testing

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

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2	Bulk %
1	Drill Hall	<18	*	*
2	Converted Firing Range/Classroom	<18	*	*
3	Drill Hall - Floor	*	<110	*
4	Drill Hall – Top of Electrical Panel	*	<110	*
5	Drill Hall – Top of Table	*	<110	*
6	Kitchen – Top of Microwave	*	<110	*
7	Kitchen – Top of Ice Machine	*	<110	*
8	Drill Hall – Floor by Entrance to Converted Firing/Classroom Range	*	<110	*
9	Converted Firing Range/Classroom – Carpet Floor	*	<110	*
10	Converted Firing Range/Classroom – Top of TV	*	<110	*
11	Converted Firing Range/Classroom – Top of Printer	*	<110	*
12	Room 45 – Top of File Cabinet	*	<110	*
13	Room 107 – Top of Book Case	*	<110	*
14	Room 121 – Top of Desk	*	<110	*
15	Room 204 – Top of Wall Locker	*	<110	*
16	Blank - Wipe	*	<12	*
17	Blank - Air	<3	*	*
18	Kitchen Ceiling	*	*	0.083%
19	Wall Locker Storage Area Ceiling	*	*	0.095%
-	**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:

1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges
2. OSHA 29CFR1910.1025 Lead Standard

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

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

- Surface levels for lead were less than the recommended guideline of 200 ug/ft^2 in all locations sampled.

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

- Two lead bulk samples were collected from areas with peeling paint. Both samples were less than the lead based paint criteria.

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Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98082EL). The light meter was last calibrated in April 2013. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Drill Hall	20	10	Yes
Garage/Vault Storage Area	**7.8**	**30**	**NO**
Converted Firing Range/Classroom	97.4	30-50	Yes
Kitchen	**34.0**	**50**	**NO**
Lounge Room 107	13.1	10	Yes
Office 114	95.3	30-50	Yes
Office 115	55.2	30-50	Yes
Office 116	87.4	30-50	Yes
Office 118	54.1	30-50	Yes
Office 121	39.0	30-50	Yes
Room 209 Wall Locker Storage Area	116.1	10	Yes
Office 209-A	51.2	30-50	Yes
Office 205	59.2	3050	Yes
Room 204 Wall Locker Storage Area	109.7	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 kitchen and garage/vault storage 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	81.7	25.2	433	0.0
Office 115	77.5	43.5	414	0.0
Criteria	**68-79**	**30-60**	**<1,133**	**<9**

Table Notes:

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

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements met the recommended 68-79°F in all sampled areas.

- Relative humidity levels met the recommended guideline of 30 – 60 % in all sampled areas.

- Carbon dioxide levels were measured to evaluate building ventilation or the introduction 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

1,133 ppm (700 ppm + 433 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. It was reported that there is a roof leak in the garage area beside the garage door.

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Section 6.0 Suspect Asbestos Containing Building Materials (ACM)

Suspect (ACM) (asbestos containing material) was noted at the time of this survey:

Suspect asbestos containing material (ACM) 9”X9” floor tile and pipe insulation was observed 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	1228008	7/2012	NA
Cal Light 400 Light Meter	98002EL	4/2013	NA
SKC Air Sampling Pump	LVP06	7/25/13	2.5 LPM
SKC Air Sampling Pump	767926	7/25/13	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.

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Appendix A. Laboratory Analysis Report

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	ARNG-MD	**Chain Of Custody:**	516447
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Glen Burnie-RC	**Date Submitted:**	7/29/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	7/31/2013 **Report Date:** 8/1/2013
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
13080975	1	Flame	Air	170	N/A	18	ug/m³	<3	<18	ug/m³	
13080976	2	Flame	Air	170	N/A	18	ug/m³	<3	<18	ug/m³	
13080977	3	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080978	4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080979	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080980	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080981	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080982	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080983	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080984	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080985	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080986	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080987	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080988	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080989	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080990	16	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13080991	17	Flame	Air	0	N/A	3	ug/m³	<3	<3	ug	
13080992	18	Flame	Paint Chip	****	N/A	0.01	%Pb		0.083	%Pb	
13080993	19	Flame	Paint Chip	****	N/A	0.0087	%Pb		0.095	%Pb	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

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

Client:	National Guard Bureau	**Job Name:**	ARNG-MD	**Chain Of Custody:**	516447		
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Glen Burnie-RC	**Date Submitted:**	7/29/2013		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	7/31/2013	**Report Date:**	8/1/2013
Attention:	[redacted]						

Summary of Atomic Absorption Analysis for Lead

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

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)
%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)

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

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

Air and Wipe results are not corrected for any blank results

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

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

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

Analyst: Nida McGarvey / Kim Shipe   **Technical Manager:** G Edward Carney

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

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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **516447**

1 of 2

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

Submittal Information:
1. Job Name: ARNG - MD
2. Job Location: Glen Burnie - RC
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Perso[redacted] @ [redacted]2-0273
5. Submitted by:[redacted]gnature:[redacted]

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

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

NORMAL BUSINESS HOURS
☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day + Date Due: 4/5/13
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ Ema[redacted] compliance place. com
☐ Fax[redacted]us.army.mil
☐ Veri[redacted]us.army.mil

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

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

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

Metals Analysis
☒ Pb Paint Chip 2 (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 14 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

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

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1	Drill Hall	7-25	170					X		X						
2	Converted Range		170					X		X						
3	Drill Hall floor			100 cm²				X				X				
4	Drill Hall - top of Elec. Panel							X				X				
5	Drill Hall - Table							X				X				
6	Kitchen - Microwave							X				X				
7	Kitchen - Ice Machine							X				X				
8	Drill Hall - floor to Range							X				X				
9	Range - carpet floor							X				X				
10	Range - TV							X				X				
11	Range - Printer							X				X				
12	Room 115 - File Cabinet							X				X				

CLIENT CONTACT
(LABORATORY STAFF ONLY)

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

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 7 / 29 / 13 @ 0900 Via: FedEx By (Print): [illegible] Sign: [illegible]
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ____ Sign: ____ Time: ____
3. Results Reported To: ____ Via: ____ Date: ____ / ____ / ____ Time: ____
4. Comments: 1193 Shell 49886

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

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Focused on Results www.amalab.com
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4. Contact Perso[redacted] Non-Responsive @ phone # (410) 942-0273
5. Submitted by: [redacted] ...ature: [redacted] Non-Responsive

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

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

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

REPORT TO:
☒ Inclu[redacted] Non-Responsive ...with Report
☒ Emai[redacted] compliance-plus.com
☐ Fax: [redacted] us.army.mil
☐ Verba[redacted] us.army.mil

Asbestos Analysis

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

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

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

MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

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

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

TEM Water
☐ Qual. (pres/abs) ____(QTY)
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☐ EPA 100.1 ____(QTY)

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

Metals Analysis
☑ Pb Paint Chip 2 (QTY)
☑ Pb Dust Wipe (wipe type Ghost) 14 (QTY)
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☐ Pb Soil/Solid ____(QTY)
☐ Pb TCLP ____(QTY)
☐ Drinking Water ☐ Pb ____(QTY) ☐ Cu ____(QTY) ☐ As ____(QTY)
☐ Waste Water ☐ Pb ____(QTY) ☐ Cu ____(QTY) ☐ As ____(QTY)
☐ Pb Furnace (Media ____) ____(QTY)

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

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13 Room 127	- Book Case	7-25		100 cm2				X				X				
14 Room 121.	Desk							X				X				
15 Room 204	Wall locker							X				X				
16 Blank				0				X				X				
17 Blank			0					X		X						
18 Kitchen	Ceiling							X			X					
19 Room 204	- Ceiling							X			X					

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time: Contact: By:

Date/Time: Contact: By:

Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)

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

Appendix B. Photographs

Exterior of facility

Drill Hall

Converted range area now a classroom and weight room

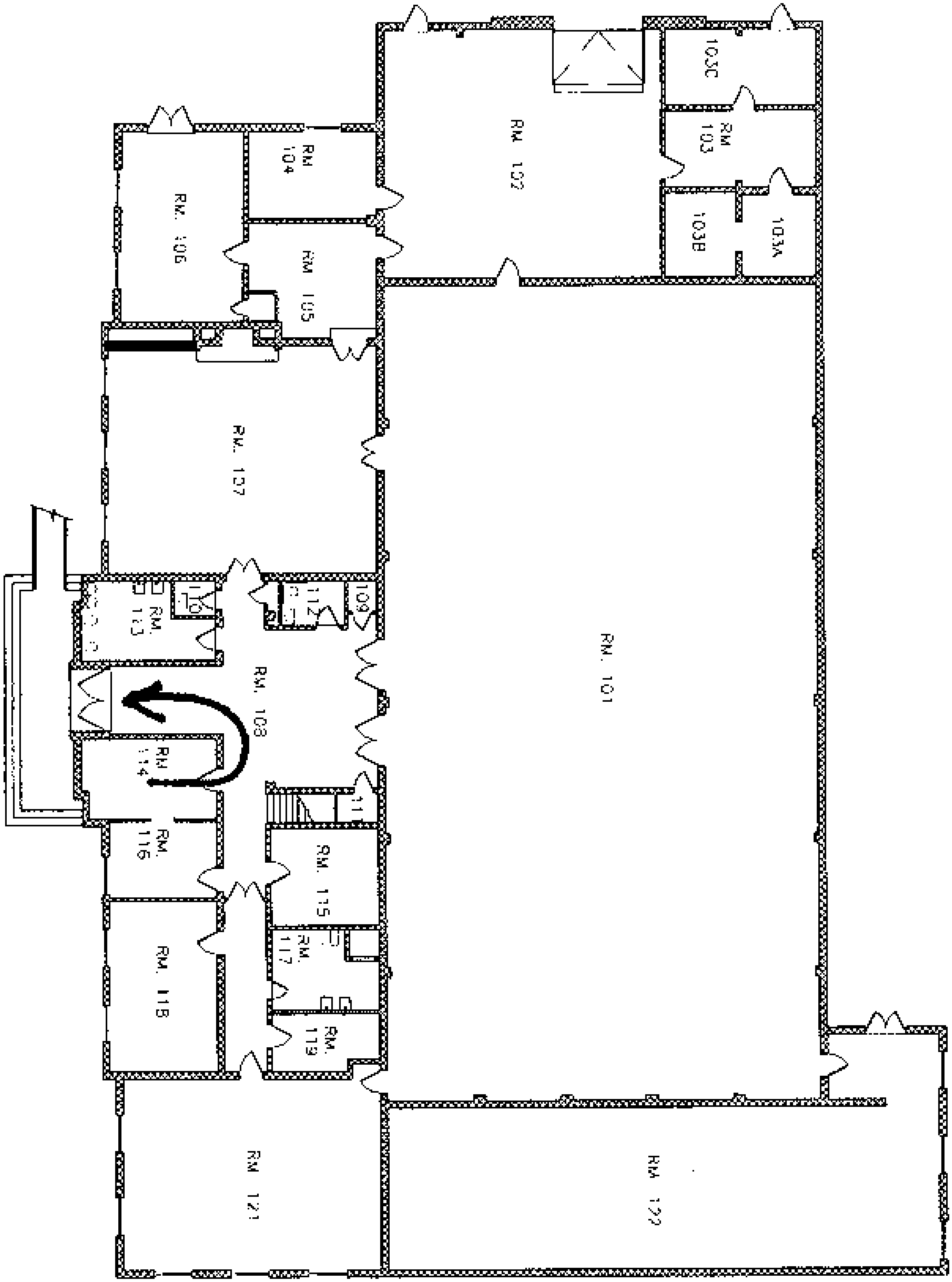
Suspect asbestos pipe insulation in good condition

Suspect asbestos floor tile in good condition

Kitchen ceiling peeling paint

Second floor wall locker storage area peeling paint on ceiling

Appendix C. Floor Plan



FIRST FLOOR PLAN
GLEN BURNIE ARMORY

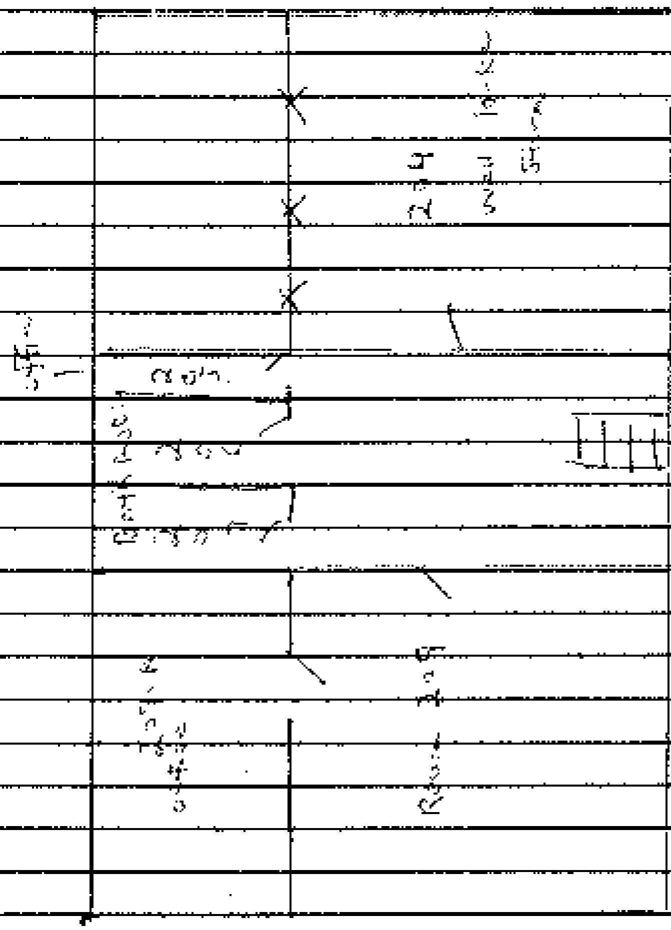
COMPLIANCE MANAGEMENT INTERNATIONAL

1215 Manor Drive, Suite 205
Mechanicsburg, PA 17055
Phone: 215.699.4800
Fax: 215.699.8315

Daily Notes

Date: 7-28-13 **Project Name:** Glen Burnie RC

2nd Floor



X = wall map error disregard

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, 27th Edition.

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

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

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

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

8. National Ambient Air Quality Standards (NAAQS) - National primary ambient air quality standards for carbon monoxide 40 CFR 50.8.

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

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

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

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

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

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

MCHB-TS-OFS

MAY 0 9 2007

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

SUBJECT: Maryland Army National Guard Facilities, Industrial Hygiene Baseline Survey, Report No. 55-ML-01ED-03/07, MG (Brevet) John R. Kenly Armory, Greenbelt, MD, 13 August 2003

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

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

FOR THE COMMANDER:

[redacted]

Encl

Director, Occupational Health Sciences

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

Readiness thru Health

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

USACHPPM

MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEY
REPORT NO. 55-ML-01ED-03/07
MG (BREVET) JOHN R. KENLY ARMORY
GREENBELT, MD
13 AUGUST 2003

Distribution limited to U.S. Government agencies. 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

Readiness Thru Health

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

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

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

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

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

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

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

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

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

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

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

MCHB-TS-OFS

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEY
REPORT NO. 55-ML-01ED-03/07
MG (BREVET) JOHN R. KENLY ARMORY
GREENBELT, MD
13 AUGUST 2003

1. PURPOSE OF EVALUATION. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) MG (Brevet) John R. Kenly Armory, Greenbelt, 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 work history of exposures is provided for each civilian or military employee.

2. CONCLUSIONS. The significant health risks identified at the Armory were potential lead exposures from deteriorating paint and from incomplete decontamination of the former indoor firing range (IFR), deteriorated asbestos-containing floor tiles, and mold growth. Water quality should also be assessed.

3. RECOMMENDATIONS.

a. Lead Exposure. Health Risk Assessment Code (RAC) 3. Establish and execute a lead hazard management plan, and take immediate corrective action where a possible lead-related health hazard has been identified. Repair and stabilize all deteriorated paint surfaces. Clean all areas in and adjacent to the former IFR immediately and other areas where sampling results showed elevated levels of lead. Follow the cleaning guidance in Appendix F of the report and in National Guard Pamphlet 420-15. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. Address all potential lead hazards before continuing to extend the use of this facility to children. If children will continue to use this facility, clean surfaces to the Environmental Protection Agency lead in dust standard for young children of 40 micrograms per square foot ($\mu g/ft^2$) on floors 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 recommended maximum level of 200 $\mu g/ft^2$ for lead in dust on all other surfaces.

b. Asbestos Exposure. Health RAC 3 if abatement has not been done. Confirm that asbestos has been abated.

Readiness thru Health

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EXSUM, MDARNG Facilities IH Baseline Surveys, MG (Brevet) John R. Kenly Armory, Greenbelt, MD, Report No. 55-ML-01ED-03/07, 13 August 2003

c. Mold Exposure and Indoor Air Quality. Health RAC 4. Repair the source of the water damage on the Recruiter's Office floor. Abate all areas of visible mold using the cleaning guidance in Appendix G. To reduce the moisture level in the air, increase ventilation in cooler weather and dehumidify damp spaces in warmer weather. Dehumidifying can be accomplished either by closing the windows and turning on window air conditioning units or by using a portable dehumidifier in the summer months. Evaluate indoor air quality in a future survey.

d. Water Quality. No RAC can be assigned at this time. Test the drinking water from water fountains and faucets for lead and for any other potential contaminants that can be identified.

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MDARNG Facilities IH Baseline Surveys, MG (Brevet) John R. Kenly Armory, Greenbelt, MD, Report No. 55-ML-01ED-03/07,13 August 2003

TABLE OF CONTENTS

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INDUSTRIAL HYGIENE BASELINE SURVEY
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MG (BREVET) JOHN R. KENLY ARMORY
GREENBELT, MD
13 AUGUST 2003

1. REFERENCES. See Appendix A.

2. PURPOSE. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) MG (Brevet) John R. Kenly Armory, Greenbelt, 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 history of workplace exposures is provided for each civilian or military employee.

3. AUTHORITY. Fax, National Guard Bureau Region North Industrial Hygiene Office (NGB-ARS-IHNE/Ms. [redacted]), 28 February 2003, subject: SAB.

4. GENERAL.

a. Personnel Contacted. This information was not available.

b. Survey Personnel. Ms. [redacted], Industrial Hygienist, United States Army Center for Health Promotion and Preventive Medicine (USACHPPM) conducted this survey on 13 August 2003.

c. Risk Assessment Codes (RACs). The Department of Defense Instruction (DODI) 6055.1 provides a method for assigning RACs to health hazards that are based on the magnitude of exposures to physical, chemical, and biological agents and the possible medical effects. The DODI 6055.1 also provides RACs for safety and ergonomic hazards. A RAC is an expression of the risk associated with a hazard that combines the hazard severity and accident probability into a single numeral. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

d. Background. The Armory mission was to support Company C, 1st Battalion, 115th Infantry Regiment, Battery B, 2nd Battalion, and 110th Field Artillery Regiment. The date of construction was 1954. Floor plan and photographs are in Appendices D and E respectively. The point of contact stated that children occupy the Armory one to two times per year for family support activities. However, numerous advertised community events indicated that children may visit the Armory more frequently.

5. METHODOLOGY.

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

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

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

6. FINDINGS AND DISCUSSION

a. Description of Operations. Activities at the Armory included drills, office work, and minor vehicle maintenance.

b. Occupational Safety and Health Programs. There were no written occupational safety and health programs or records available at the Armory.

c. Building Condition.

(1) Physical Condition. The building was in good condition, except for deteriorated asbestos-containing floor tiles and mold growth as discussed below.

(2) Housekeeping. No housekeeping deficiencies were observed.

d. Indoor Air Quality.

(1) Heating, Ventilation, and Air-Conditioning Systems. The building was heated by an oil-fired hot water system. Cooling was provided by several window-type air conditioners mounted in regularly used offices and by manual operation of windows.

MDARNG Facilities IH Baseline Surveys, MG (Brevet) John R. Kenly Armory, Greenbelt, MD, Report No. 55-ML-01ED-03/07, 13 August 2003

(2) Indoor Air Quality. The site measurements could not be located for this report. However, as noted below, mold growth in the Storage Room indicated inadequate control of humidity.

e. Water Quality. Building occupants stated that the drinking water had never been tested and that they were concerned about the water quality.

f. Lead Hazards. The age of the building indicated that the presence of lead in paint was likely. Many rooms in the Armory had extensive areas of deteriorated paint. Staff Sergeant (SSG) [redacted], Environmental Compliance Assessment Coordinator for the State of Maryland Environmental Office, stated that the former indoor firing range (IFR) had been decontaminated. The former IFR was being used as a storage room at the time of the site visit.

(1) Lead Criteria. The EPA and State of Maryland limits for lead in dust are 40 micrograms per square foot (µg/ft^2) on floors, 250 µg/ft^2 on windowsills, and 400 µg/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 µg/ft^2 on floors and frequently contacted surfaces, which is more stringent for windowsills than the EPA/State of Maryland standards. This level was adopted from OSHA Compliance Letter 02-02-58. Further details are in Appendix C. The OSHA PEL for lead in air is 0.05 milligram per cubic meter averaged over an 8-hour day. The EPA and State of Maryland definition of lead-based paint (LBP) is a lead content of 0.5 percent or greater by mass.

(2) Lead Measurements. The laboratory report is in Appendix B.

(a) Lead in surface dust. Results are shown in the Table. All sample results that were greater than or equal to 40 µg/ft^2 for floors or 200 µg/ft^2 for other surfaces are highlighted. Photographs of sample locations are provided in Appendix E. High levels of lead were found on the floor near the firing line and on the windowsill in the former IFR.

(b) Lead in Air. General area sampling was conducted in the Orderly Room (six occupants), a classroom on the second floor, and the Recruiter's office. All results were below the laboratory reporting limit as well as the OSHA 8-hour time-weighted average PEL of 0.05 milligrams per cubic meter.

(c) Lead in Paint. Deteriorated paint was sampled on the wall in the hallway near the Orderly Room and the Recruiter's Office, in the Orderly Room on the floor under the window in SSG [redacted] office, and on the ceiling of the Drill Hall. Photographs of the first two sample locations are provided in Appendix E. The results ranged from 0.049 to 0.280 percent lead. None of the samples met the EPA and State of Maryland definition of LBP. However, deteriorated paint containing any detectable level of lead may pose a lead hazard.

MDARNG Facilities IH Baseline Surveys, MG (Brevet) John R. Kenly Armory, Greenbelt, MD, Report No. 55-ML-01ED-03/07, 13 August 2003

TABLE. Lead in Surface Dust.

Wipe Sample #	Location of Samples	Conc. (µg/ft²)
GBW01	Orderly Room, desktop	<23
GBW02	Orderly Room, wall	<23
GBW03	SGT [redacted] office, floor under window	<23
GBW04	Recruiter's Office, top of cabinet	<23
GBW05	Recruiter's Office, floor under window	<23
GBW06	Kitchen, table top	36
GBW07	Kitchen, top of icemaker	<23
GBW08	Former IFR, floor near bullet trap location	35
GBW09	Former IFR, floor near firing line	339
GBW10	Former IFR, window sill	287
GBW11	Second floor locker room, floor near window	<23
GBW12	Second floor locker room, top of cabinet	<23
GBW13	Supply Sergeant's Office, desktop	<23
GBW14	Lobby, floor near front doors	<23
GBW15	"Club" area, countertop	<23

g. Other Chemical Hazards.

(1) Asbestos. There were asbestos-containing floor tiles throughout the facility. In the recruiter's office, several tiles were missing or cracked. The SSG [redacted] stated that asbestos abatement was planned for the January 2005 timeframe.

(2) Mold. Mold was growing on the exercise equipment and table in the storage room. This appeared to be due to excessive air humidity. See Photographs 12 and 15, Appendix E. In the Recruiter's Office, a mat covered an area of the floor where tiles were missing or cracked. There was visible moisture under the mat, providing the potential for mold growth and for further damage to tiles. The most likely cause was leakage from heating pipes running under the floor at this location.

h. Industrial Ventilation Systems. There were no industrial ventilation systems at the Armory.

i. Noise Hazards. No operations with the potential to generate hazardous noise levels were identified.

j. Lighting. All areas were visually judged to be adequately lit and no occupants reported areas of deficient lighting.

k. Ergonomics. No potential ergonomic hazards were observed or reported.

l. Safety Hazards. No safety hazards were observed or reported.

7. CONCLUSIONS. The significant health risks identified at the Armory were potential lead exposures from deteriorating paint and from incomplete decontamination of the former IFR, deteriorated asbestos-containing floor tiles, and mold growth. Water quality should also be assessed.

8. RECOMMENDATIONS.

a. Lead Exposure. Health RAC 3. Establish and execute a lead hazard management plan, and take immediate corrective action where a possible lead-related health hazard has been identified. Repair and stabilize all deteriorated paint surfaces. Clean all areas in and adjacent to the former IFR immediately and other areas where sampling results showed elevated levels of lead. Follow the cleaning guidance in Appendix F and in National Guard Pamphlet 420-15. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. Address all potential lead hazards before continuing to extend the use of this facility to children. If children will continue to use this facility, clean surfaces to the EPA lead in dust standard for young children of 40 $\mu g/ft^2$ on floors and clean all remaining areas to the NGB Region North Industrial Hygiene Office and USACHPPM recommended level of 200 g/ft^2 for lead in dust on all other surfaces.

b. Asbestos Exposure. Health RAC 3 if abatement has not been done. Confirm that asbestos has been abated.

c. Mold Exposure and Indoor Air Quality. Health RAC 4. Repair the source of the water damage on the Recruiter's Office floor. Abate all areas of visible mold using the cleaning guidance in Appendix G. To reduce the moisture level in the air, increase ventilation in cooler weather and dehumidify damp spaces in warmer weather. Dehumidifying can be accomplished either by closing the windows and turning on window air conditioning units or by using a portable dehumidifier in the summer months. Evaluate indoor air quality in a future survey.

d. Water Quality. No RAC can be assigned at this time. Test the drinking water from water fountains and faucets for lead and for any other potential contaminants that can be identified.

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

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

APPROVED:

[redacted]
Program Manager
Industrial Hygiene Field Services Program

APPENDIX A

REFERENCES

Literature Cited.

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

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

3. AR 40-5, Medical Service, Preventive Medicine, 22 July 2005.
http://www.usapa.army.mil/pdffiles/r40_5.pdf

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

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

6. American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs), ACGIH, Cincinnati, OH, 2005.
http://www.acgih.org/TLV/

7. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality.

8. Illuminating Engineering Society of North America, ANSI/IESNA Standard RP-1-2004, American National Standard Practice for Office Lighting.

9. USACHPPM Interim Report No. 39-EJ-1157-99, Derivation of Wipe Surface Screening Levels for Environmental Chemicals, 1999.

10. OSHA Instruction, CPL 02-02-058 - CPL 2-2.58 - 29 CFR 1926.62, Lead Exposure In Construction; Interim Final Rule-- Inspection and Compliance, Procedures, 1993.
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=1570

MDARNG Facilities IH Baseline Surveys, MG (Brevet) John R. Kenly Armory, Greenbelt, MD, Report No. 55-ML-01ED-03/07,13 August 2003

11. U.S. Department of Housing and Urban Development (HUD), Technical Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing 1998. http://www.hud.gov/offices/lead/guidelines/hudguidelines/index.cfm

12. NG Pam 420-15, Facilities Engineering, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.

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APPENDIX B
LABORATORY REPORT

RESERVOIRS ENVIRONMENTAL, INC.

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

TABLE ANALYSIS: LEAD BY WIPE SAMPLING

RES Job Number:	**RES 96611-1**
Client:	**Army National Guard IH - West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**Greenbelt, MD**
Date Samples Received:	**August 19, 2003**
Analysis Type:	**USEPA SW846 3050B / AA(7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 26, 2003**

Client ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
GBBLANK1	EM 806480	0.11	BDL	23	BDL
GBW01	EM 806481	0.11	BDL	23	BDL
GBW02	EM 806482	0.11	BDL	23	BDL
GBW03	EM 806483	0.11	BDL	23	BDL
GBW04	EM 806484	0.11	BDL	23	BDL
GBW05	EM 806485	0.11	BDL	23	BDL
GBBLANK2	EM 806486	0.11	BDL	23	BDL
GBW06	EM 806487	0.11	4.0	23	36
GBW07	EM 806488	0.11	BDL	23	BDL
GBW08	EM 806489	0.11	3.8	23	35
GBW09	EM 806490	0.11	37.3	23	339
GBW10	EM 806491	0.11	31.6	23	287
GBBLANK3	EM 806492	0.11	BDL	23	BDL
GBW11	EM 806493	0.11	BDL	23	BDL
GBW12	EM 806494	0.11	BDL	23	BDL
GBW13	EM 806495	0.11	BDL	23	BDL
GBW14	EM 806496	0.11	BDL	23	BDL
GBW15	EM 806497	0.11	BDL	23	BDL
GBBLANK4	EM 806498	0.11	BDL	23	BDL

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

BDL - Below Detection Limit

Data Qa

RESERVOIRS ENVIRONMENTAL, INC.

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

TABLE ANALYSIS: LEAD IN PAINT

RES Job Number:	**RES 96611-1**
Client:	**Army National Guard IH - West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**Greenbelt, MD**
Date Samples Received:	**August 19, 2003**
Analysis Type:	**USEPA SW846 3050B / AA (7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 26, 2003**

Client ID Number	Lab ID Number	Detection Limit (%)	LEAD CONCENTRATION (%)
GBBULK01	EM 806499	0.005	0.220
GBBULK02	EM 806500	0.005	0.280
GBBULK03	EM 806501	0.005	0.049

BDL = Below Detection Limit

Data Qa

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RESERVOIRS ENVIRONMENTAL, INC.

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

TABLE ANALYSIS: LEAD IN PAINT

RES Job Number:	**RES 96611-1**
Client:	**Army National Guard III - West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**Greenbelt, MD**
Date Samples Received:	**August 19, 2003**
Analysis Type:	**USEPA SW846 3050B / AA (7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 26, 2003**

Client ID Number	Lab ID Number	Detection Limit (%)	LEAD CONCENTRATION (%)
GBBULK01	EM 806499	0.005	0.220
GBBULK02	EM 806500	0.005	0.280
GBBULK03	EM 806501	0.005	0.049

BDL - Below Detection Limit

Data Qa

APPENDIX C

PROPOSED 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 National Guard Bureau (NGB) Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 micrograms per square foot ($\mu g/ft^2$). If a special function will be held in which children will be present in this facility, consider thoroughly cleaning the areas that will be accessible to children prior to the function. This guidance is based on professional judgment, risk assessments, adaptation of Occupational Safety and Health Administration (OSHA) guidance, and feasibility of cleaning to a certain level.

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

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

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

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

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

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

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

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

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

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

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

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/m^3 averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead dust in this building.

APPENDIX D

FLOOR PLAN

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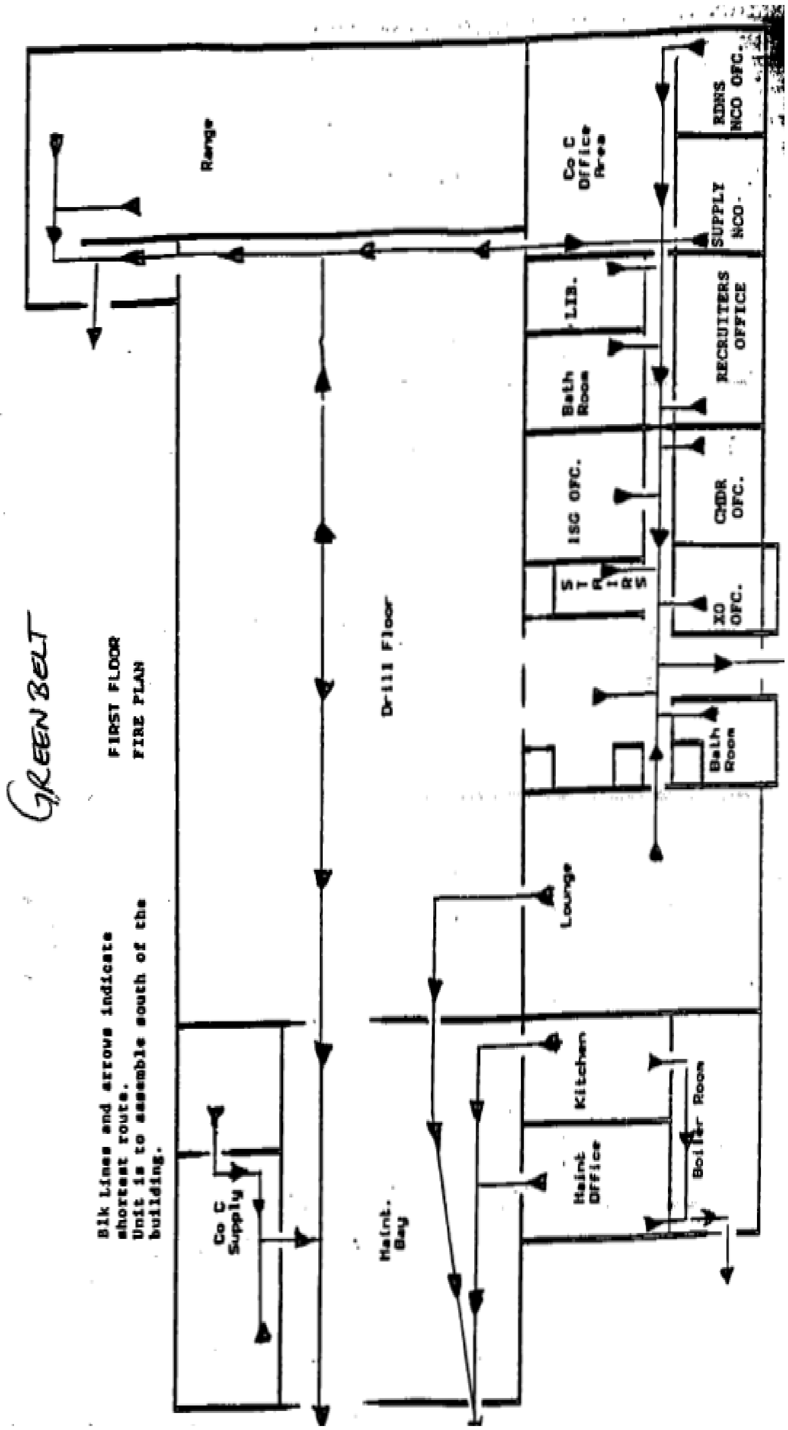

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APPENDIX E

PHOTOGRAPHS

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List of Photographs

Photograph No.	Location	Sample
1	Wall, hallway near Orderly Room and Recruiter's Office	
2	Wall, hallway near Orderly Room and Recruiter's Office	Bulk paint
3	Orderly Room, desktop	GBW01
4	Orderly Room, wall	GBW02
5	SGT [redacted] Office, floor under window	GBW03
6	SGT [redacted] Office, window	Bulk paint
7	Recruiter's Office, top of cabinet	GBW04
8	Recruiter's Office, floor under window	GBW05
9	Kitchen, table top	GBW06
10	Kitchen, top of icemaker	GBW07
11	Former IFR, floor near bullet trap location	GBW08
12	Former IFR, mold on exercise equipment and chair	
13	Former IFR, floor near firing line	GBW09
14	Former IFR, window sill	GBW10
15	Former IFR, mold growth	
16	Second floor locker room, floor near window	GBW11
17	Second floor locker room, top of cabinet	GBW12
18	Supply Sergeant's Office, desktop	GBW13
19	Lobby, floor near front doors	GBW14
20	"Club" area, countertop	GBW15

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Photograph 1.

Photograph 2.

Photograph 3.

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Photograph 4.

Photograph 5.

Photograph 6.

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Photograph 7.

Photograph 8.

Photograph 9.

E-3

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Photograph 10.

Photograph 11.

Photograph 12.

E-4

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Photograph 13.

Photograph 14.

Photograph 15.

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Photograph 16.

Photograph 17.

Photograph 18.

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Photograph 19.

Photograph 20.

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APPENDIX F

LEAD CLEANING GUIDANCE

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

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CHAPTER 14: CLEANING

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Step-by-Step Summary

Cleaning: How To Do It

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

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

Chapter 14: Cleaning

I. Introduction

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

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

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

A. Performance Standard

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

B. Small Dust Particles

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

C. Difficulties in Cleaning

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

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

1. Low Clearance Standards

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

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

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

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

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2. Worker Inexperience

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

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

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

4. Deadlines

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

II. Coordination of Cleaning Activities

A. Checklist

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

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?
- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

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

C. Waste Disposal

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

III. Cleaning Methods and Procedures

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

A. Containment

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

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

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

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

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

1. HEPA Vacuuming

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

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

Operating Instructions

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

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

Special Attachments

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

Selecting Appropriate Size(s)

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

Wet-Dry HEPA Vacuums

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

Prefilters

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

HEPA Vacuuming Procedures

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

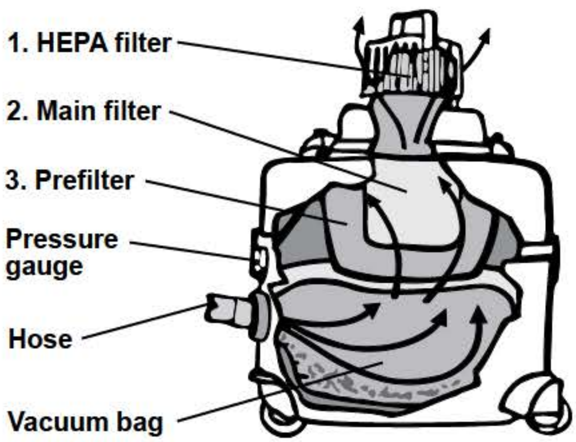
To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture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

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

Emptying the HEPA Vacuum

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

Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

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

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

2. Wet Detergent Wash

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

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

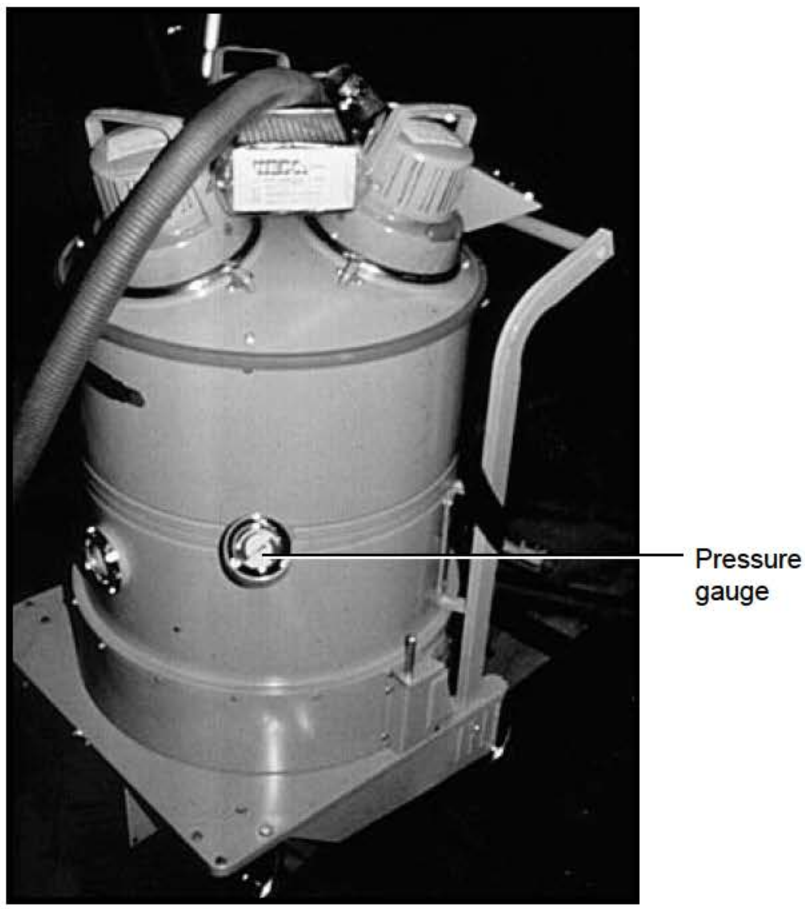
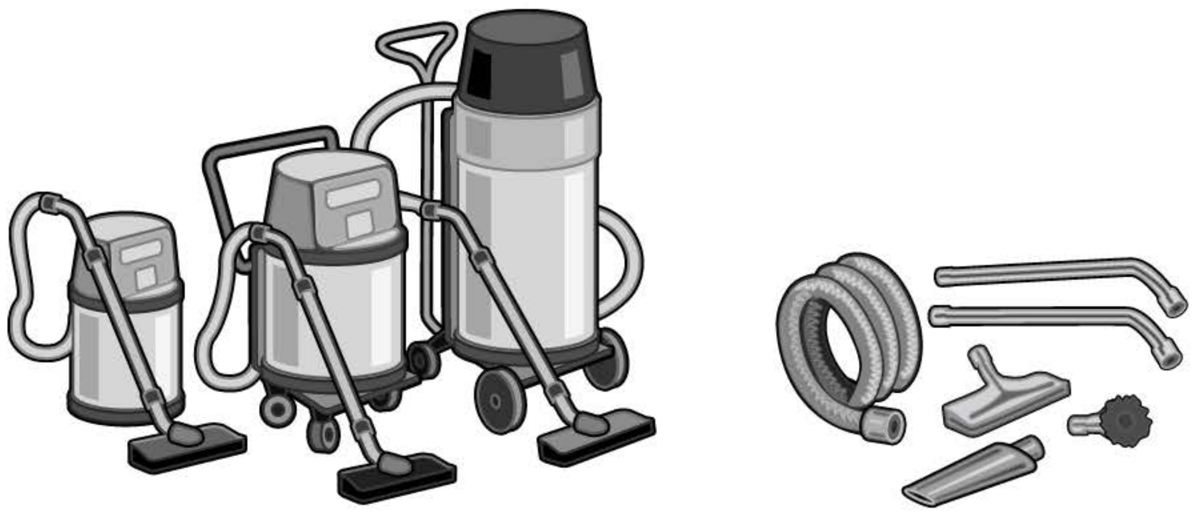


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

Figure 14.2 HEPA Vacuum Sizes and Tools.



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

Manufacturer's Dilution Instructions

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

Appropriate Cleaning Equipment

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

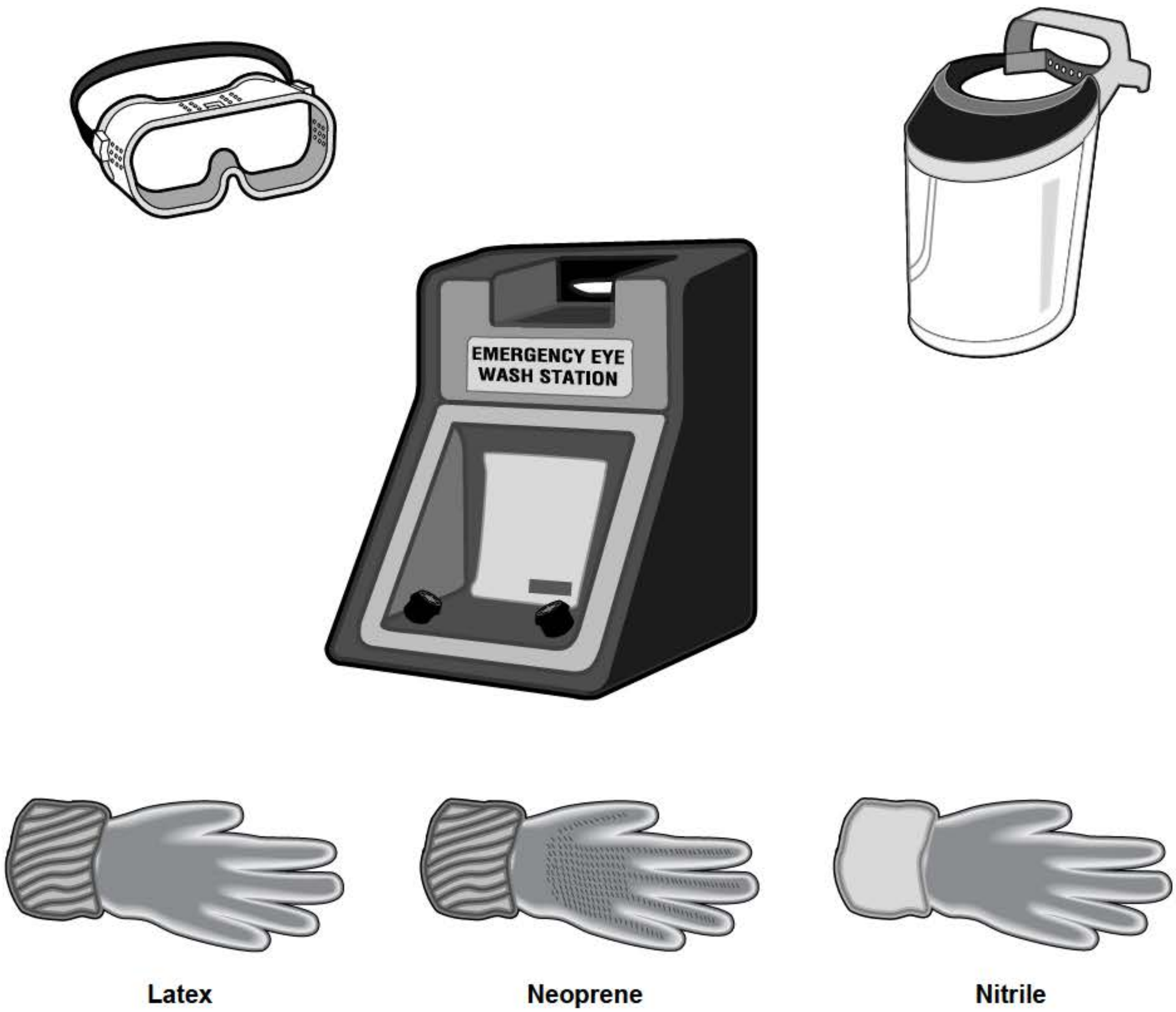
Proper Wet-Cleaning Procedures

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

Changing Cleaning Mixture

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

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



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

3. The HEPA/Wet Wash/HEPA Cycle

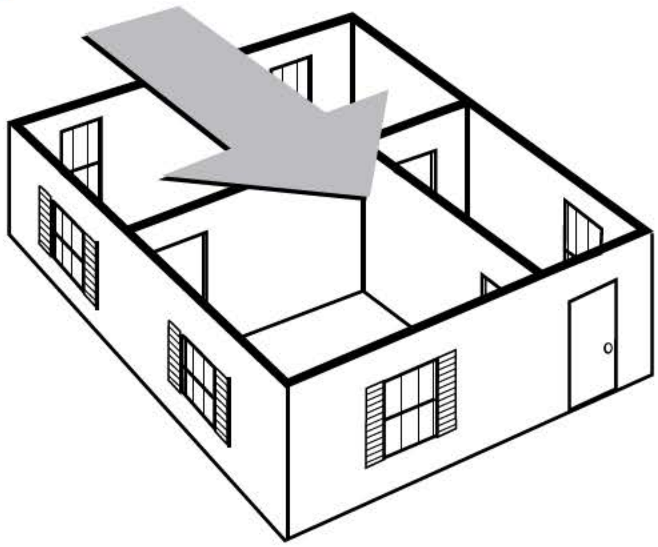
Typical Procedures

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

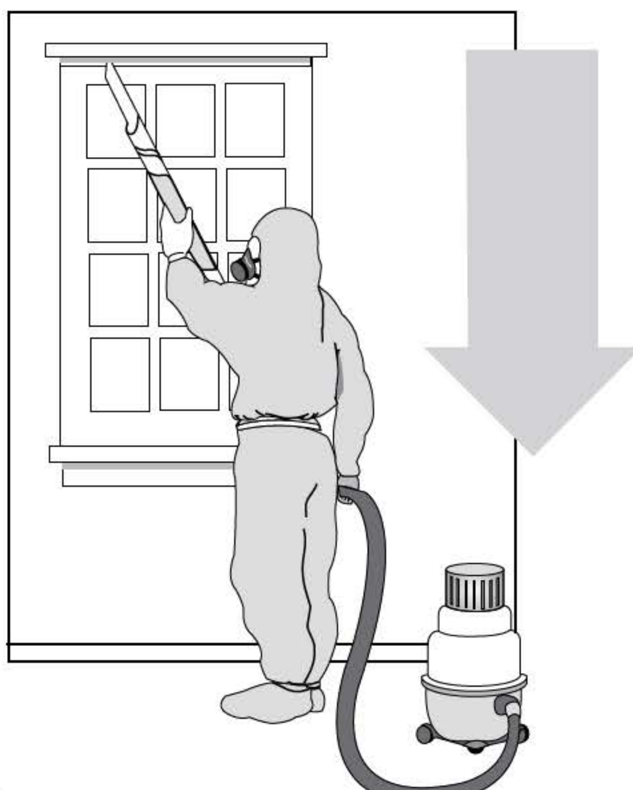
- First, the area is HEPA vacuumed.

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

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



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



Courtesy: Alice Hamilton Occupational Health Center

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

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

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

Single-Pass Wet Wash/HEPA Vacuum

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

Figure 14.4b (continued)

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

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

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

Rubber Cone

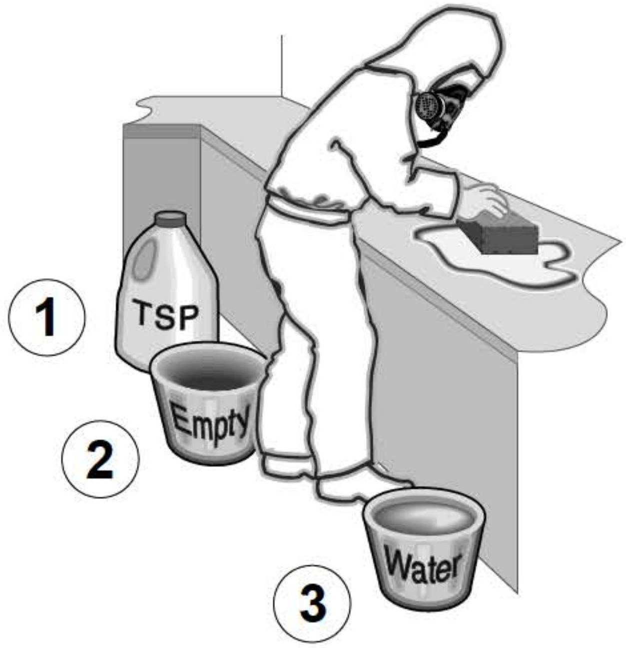
Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

Figure 14.4c (continued)

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



Wipe All Surfaces

Wet Mop Floor

Don't Dry Sweep

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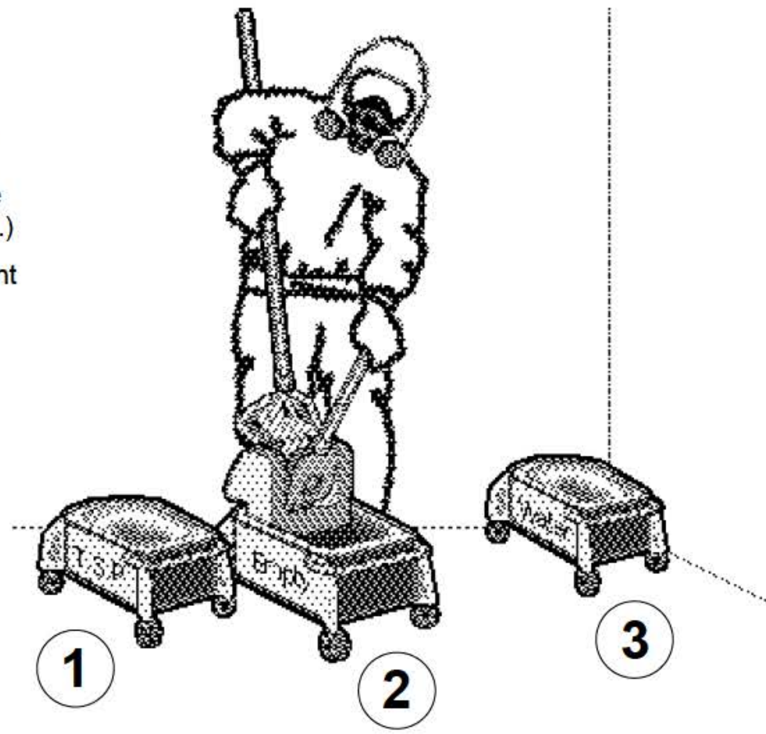
Figure 14.4c (continued)

Use the 3-Bucket System.

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

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



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

Use the third bucket for rinsing the floor.

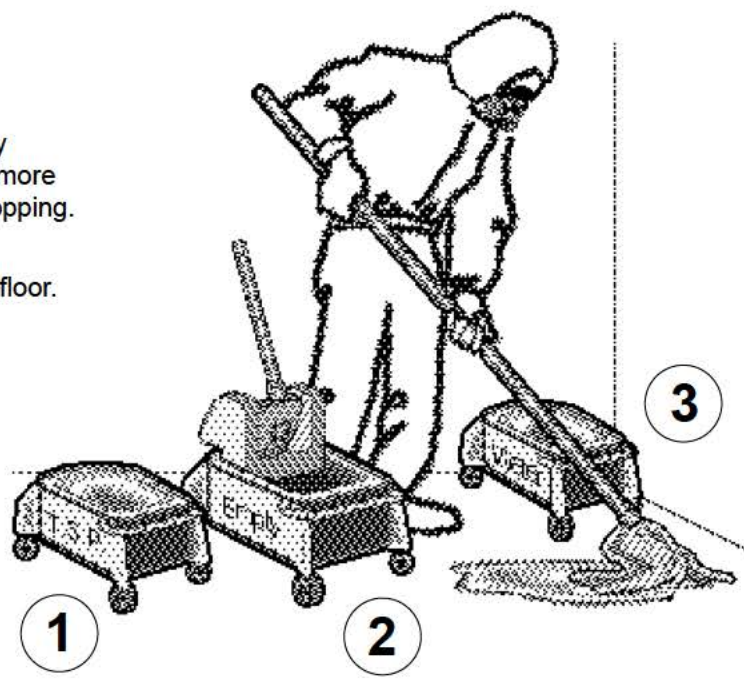
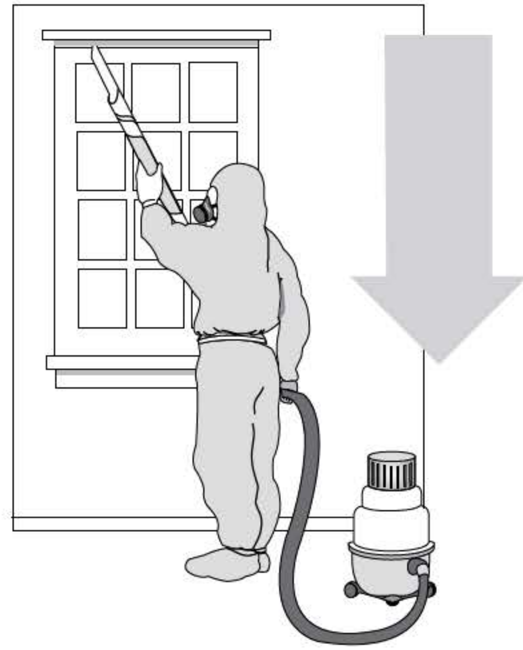


Figure 14.4d (continued)

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

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



4. Sealing Floors

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

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

IV. Order of Cleaning Procedures During Lead Hazard Control

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

A. Precleaning Procedures

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

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

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

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

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

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

B. Ongoing Cleaning During the Job

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

C. Daily Cleaning Procedures

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

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

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

1. Large Debris

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

2. Small Debris

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

3. Exterior Cleaning

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

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

4. Worker Protection Measures

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

5. Maintaining Containment

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

V. Order of Final Cleaning Procedures After Lead Hazard Control

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

A. Final Cleaning

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

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

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

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

1. Decontamination of Workers, Supplies, and Equipment

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

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

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

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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

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

B. Preliminary Visual Examination

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

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

C. Surface Painting or Sealing of Nonfloor Surfaces

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

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

D. Final Inspection

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

E. Recleaning After Clearance Failure

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

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

VI. Cleaning Cost Considerations

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

A. Initial Clearance Test Failure Rates

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

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

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

B. Key Factors In Effective Cleaning

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

C. Special Problems

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

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

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

VII. Alternative Methods

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

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

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

A. Vacuums

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

B. Trisodium Phosphate and Other Detergents

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

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

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

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

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

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

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

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

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

APPENDIX G

MOLD CLEANING GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

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Readiness thru Health

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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

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)

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.

Seal ventilation ducts/grills in the work area and areas directly adjacent with 6 mil polyethylene sheeting. Use an exhaust fan with a High Efficiency Particulate Air (HEPA) filter to generate negative pressurization.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

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

The work area and surrounding areas should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

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

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level III be followed.

Level III: Large Area – Total Surface Area affected greater than 100 square feet or potential for increased occupant or remediator exposure during remediation is estimated to be significant. (See Appendix B for detailed guidance).

The following procedures are recommended:

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from occupied spaces using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft^2) follow Level I guidance for PPE and containment and for a areas (>10 ft^2) follow Medium (Level II) or when greater than 100 ft^2 follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

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

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

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

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

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

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

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and removed in double-bagged 6-mil plastic. When a decontamination room is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

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

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air (4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If remediation sampling is necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HAZARD COMMUNICATION

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.

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

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

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

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water Damage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£	
Water-Damaged Material†	**Actions**
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours§	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans.
Ceiling tiles	• Discard and replace.
Cellulose insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	• Discard and replace.

Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling should be pried away from wall for drying

£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.
These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

† If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

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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).

APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278

February 2002

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*[1] will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination[2].

Safety Tips While Investigating and Evaluating Mold and Moisture Problems[3]

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate[1].

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems[3].

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination[2].

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air[4]. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control[4]."

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program. For further mold assistance, contact USACHPPM, Industrial Hygiene Field Services Program, DSN 584-3118 or (410) 436-3118.

References

1. USACHPPM Technical Guide 277, *Army Facilities Management Information Document on Mold Remediation Issues*, February 2002.

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

3. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

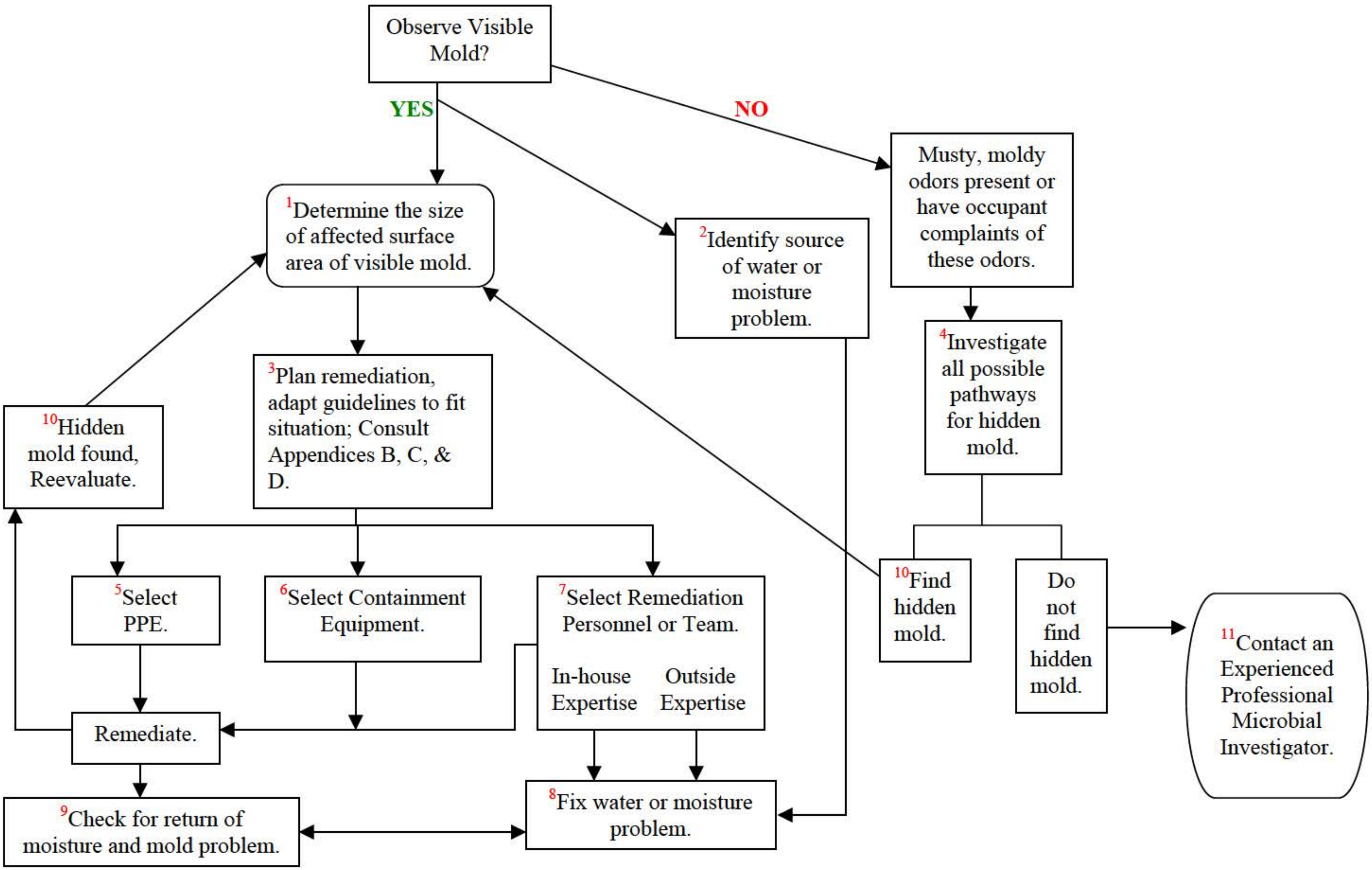
7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force*, AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

MOLD INVESTIGATION DECISION LOGIC



MOLD INVESTIGATION DECISION LOGIC NOTES:

1. Roughly approximate the total surface area of visible mold. Categorization of the remediation levels are sometimes borderline, so when trying to decide the category to apply, consider the extent of visible growth, such as a heavy blanket of growth on the surface, to barely visible. If heavy growth is apparent, consider moving up to the next level of protection.

2. Do not skip this step. Address the source of water or moisture problem or the mold will simply reappear.

3. Always protect the health and safety of the building occupants and remediators.

4. Mold may be hiding on the backside of drywall, vinyl wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads. Check walls behind furniture, pipe chases and utility tunnels, porous thermal or acoustic liners inside ductwork, or check the rafters (due to roof leaks or insufficient insulation)[3].

5. Utilize appendices B and C for remediation guidance. Use your best judgment during investigations, if not disturbing the mold you may need minimal to no PPE. Do not alarm building occupants unnecessarily, but protect yourself as necessary.

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities[3]. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

®TYVEK, DuPont de Nemours, E.I., & Co., Wilmington, DE.

APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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IES ENGINEERS

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

February 9, 2009

E-MAIL
Ms. [redacted]
NGB Regional Industrial Hygienist
Army National Guard
ATTN: NGB-ARS-IHNE
301-IH Old Bay Lane
Havre de Grace, MD 21078

Subject: Draft Industrial Hygiene Assessment Report
Greenbelt Readiness Center, Greenbelt, Maryland 20770
IES Project No. EHS08794.02

Dear [redacted]:

IES Engineers (IES) is pleased to enclose the final report of the Industrial Hygiene assessment conducted at the Army National Guard Readiness Center facility located in Greenbelt, Maryland. Thank you for the opportunity to perform this assessment. Should you have any questions, please contact [redacted] or me.

Sincerely,

[redacted], CIH
Senior Manager, Health, Safety
& Industrial Hygiene Services

cc: [redacted], ARNG
[redacted], IES
[redacted], IES

IES ENGINEERS

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

FINAL
INDUSTRIAL HYGIENE ASSESSMENT
GREENBELT READINESS CENTER
7100 GREENBELT ROAD, GREENBELT, MARYLAND 20770
SURVEY DATE: JULY 22, 2008

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

Prepared and submitted by:

Non-Responsive [redacted]
[redacted]
Industrial Hygienist

Certified Industrial Hygienist review by:

[redacted]
[redacted], CIH
Senior Manager, Health, Safety & Industrial Hygiene Services

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APPENDIX

1.0 EXECUTIVE SUMMARY

1.1 Introduction

Assessment Date: July 22, 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 7100 Greenbelt Road in Greenbelt, Maryland. The purpose of the Industrial Hygiene survey was to identify and measure the existence and extent of potentially hazardous operations or conditions at the ARNG facility. Mr. [redacted], Industrial Hygienist, of IES, performed the assessment under the direction of Mr [redacted] CIH, Senior Manager, Health, Safety & Industrial Hygiene Services, of IES. The assessment included: evaluations of operations, including engineering, work practice, administrative, and/or personal protective equipment (PPE) controls; ventilation system evaluations, including visual observations of airflow and quantitative assessments of general ventilation systems; illumination measurements and observations of the facility and conditions

Conferred With: SFC [redacted], Supervisor, Greenbelt Readiness Center

1.2 Facility Description

Greenbelt RC, located at 7100 Greenbelt Road, Greenbelt, Maryland is an 11,430-square foot training facility constructed of an interior of concrete masonry on a concrete slab with a brick exterior. Associated with the RC are offices, storage rooms, kitchen, boiler room, assembly hall, recruitment office and latrines. Photographs of the facility and maintenance activities are located in Appendix A of this report.

The RC is a two story training facility. The facility is ventilated through window-mounted air-conditioning units in a majority of the offices. Normal working hours for the six full time personnel two supervisors, two caretakers and two recruiters) are generally Tuesday through Friday from 0630 to 1700.

ENGINEERS

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. During a normal 10-hour day, the supervisors perform logistical work while the caretakers maintain the facility and grounds.

- Airborne lead was not detected in either of the two general area (GA) air samples collected on the day of the assessment. The airborne lead concentrations in each of the air samples were reported at less than 3.4 micrograms of lead per cubic meter of air ($\mu g/m^3$), which is well below the OSHA Action Level of 40 $\mu g/m^3$ for lead over a 10-hour workday.

- Wipe samples for lead that were collected from various horizontal surfaces throughout the Readiness Center indicated that the surface lead concentrations in certain areas exceeded the recommended precautionary level of 200 micrograms of lead per square foot of surface sampled ($\mu g/ft^2$). Additional cleaning using HEPA filtered vacuum systems and/or wet methods is recommended for these areas to help further reduce the potential for personnel exposure to lead.

- The average illuminance levels in some 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.

- 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, boiler room and Copy/Mail Room within the facility. IES collected paint chip samples from these areas and determined that they were not classified as lead-based paint. IES also collected a bulk sample of the damaged 9-inch by 9-inch floor tile in the Copy/Mail Room and found that the flooring material contained less than 1% asbestos, by weight.

- The air temperatures within the facility ranged from 75.6°F to 82.6°F, as compared to an outdoor temperature of 86.5°F. Two of the temperatures collected inside the building exceeded what is considered comfortable, as recommended by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). These areas, the Lounge and the Assembly Hall, were not occupied on the day of the assessment. All areas that were within the comfort parameters, set forth by ASHRAE, were ventilated by window-mounted air condtioning units. IES was informed that the facility is in the process of having all the windows replaced and all individual rooms will have window-mounted air-conditioning units installed. Indoor relative humidity ranged from 37.4% to 59.7% in the facility, as compared to an outdoor level of 62.9%. These levels are within the recognized comfort range of 30 to 60%, however, relative humidity levels above 60% are conducive to microbial growth for cellulose-based building materials such as drywall and ceiling tiles.

- Trace amounts of asbestos were found in the black 9"x9" floor tiles in the Mail/Copy Room within the Readiness Center. Approximately 1 square foot of damaged materials were identified during the assessment.

- Several health and safety items were identified during the comprehensive survey. These included:
  - Fire extinguishers were last serviced in 2006 and were not visually inspected since January 2007
  - IES observed brown water coming from a number of sinks and shower heads in the facility
  - Emergency lighting at the entrance to the Assembly Hall did not light when tested

1.4 Recommendations

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

2.0 OPERATION DESCRIPTION

INSTALLATION: RC Army National Guard
BUILDING: 7100 Greenbelt Road, Greenbelt, Maryland 20770
LOCATION: Site wide

OPERATION DESCRIPTION: On the day of the assessment, IES witnessed routine operations for the RC. Two caretakers were performing general maintenance on the facility and the grounds. This includes cleaning the latrines, cleaning windows and other building materials. Supervisors were performing logistical tasks within the office areas. IES was informed that these activities commence on a routine basis. Training at the RC occurs once a month, a weekend at a time.

CHEMICAL AND PHYSICAL AGENTS SAMPLED: General area air 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. Individual offices are ventilated with window-mounted air-conditioning units.

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 general area lead sample results suggest that the likelihood of personnel exposure to airborne lead dust is low. Wipe samples for lead that were collected from various horizontal surfaces throughout the Readiness Center indicated that the surface lead concentrations in certain areas exceeded the recommended precautionary level of 200 $\mu g/ft^2$. Although there is limited correlation between surface lead contamination and airborne lead exposures, it is recommended that the affected areas be thoroughly cleaned using HEPA filtered vacuum systems and/or wet methods. The average illuminance levels in some 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. Temperatures within the Lounge and Assembly Hall exceeded the recommended range of temperatures set forth by ASHRAE and relative humidity levels approached the upper limits for indoor air quality. Although indoor humidity levels were high, IES did not observe any mold growth or water-damaged materials that would be conducive for mold growth. Paint chip samples collected during the assessment were found not to contain lead.

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3.0 SAMPLE RESULTS AND MEASUREMENTS

3.1 Air Sampling

3.1.1 Indoor Air Quality

Measurements of air temperature, relative humidity, and CO_2 and CO concentrations were made using a calibrated direct reading hand-held TSI Q-Trak Indoor Air Quality instrument. The carbon monoxide sample results were compared with the Threshold Limit Values (TLVs) for exposure assessment purposes. TLVs are established by the American Conference of Governmental Industrial Hygienists (ACGIH) and are published annually in ACGIH's *TLVs and BEIs*. They refer to airborne exposure concentrations and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. However, because of wide variations in individual susceptibility, a small percentage of workers may experience discomfort from or be affected by some substances at concentrations below the recommended threshold limit.[(1)]

Table 1 details the air temperature, relative humidity, CO_2, and CO measurements collected throughout the building during the assessment. Refer to the Indoor Air Quality maps in Appendix B for the IAQ measurements at each location throughout the facility.

TABLE 1
AIR TEMPERATURE, RELATIVE HUMIDITY, CO_2, AND CO MEASUREMENTS

Date of Assessment: July 22, 2008
Location: National Guard RC, Greenbelt, Maryland
Analyte(s): CO_2, CO, Temperature, and Relative Humidity
Exposure Guidelines: CO_2: Indoor CO_2 concentrations should be maintained at less than 700 ppm above outdoor air levels (ASHRAE 62.1-2007)[(2)]
CO: 25 ppm (ACGIH TLV-TWA)
Temperature: 68 ºF to 79 ºF (ASHRAE 55-2004)[(3)]
Relative Humidity: 30% to 60% (ASHRAE 55-2004)[(3)]

Sample ID	Sample Description	Start - End Time (hh:mm)	Sample Time	CO_2 (ppm)	CO (ppm)	Measured Temperature (ºF)	Measured Relative Humidity (%)
A	**Lounge** - Area Sample (AS) – Approximately four feet above the ground at the center of the Lounge.	1002 – 1006	4 Min.	**503**	**0**	**82.5**	**57.3**
B	**Assembly Hall** – AS – Approximately four feet above the floor at the center of the Assembly Hall.	1006 – 1010	4 Min.	**453**	**0**	**82.6**	**59.7**
C	**Conference Room** – AS – Approximately four feet above the floor at the center the Conference Room.	1010 – 1014	4 Min.	**594**	**0**	**75.8**	**56.9**
D	[redacted] **Office** – AS – Approximately four feet above the floor at the center of [redacted] Office.	1014 – 1018	4 Min.	**592**	**0**	**75.6**	**37.4**

Sample ID	Sample Description	Start - End Time (hh:mm)	Sample Time	CO_2 (ppm)	CO (ppm)	Measured Temperature (°F)	Measured Relative Humidity (%)
E	**Classroom** – AS – Approximately four feet above the floor at the center of the Second Floor Classroom.	1018 – 1022	4 Min.	**535**	**0**	**77.6**	**43.5**
F	[redacted]**s Office** – AS – Approximately four feet above the floor at the center of [redacted] Office.	1022 – 1026	4 Min.	**552**	**0**	**78.1**	**43.3**
G	**Quarters** – AS – Approximately four feet above the floor at the center of the Second Floor Quarters.	1026 – 1030	4 Min.	**611**	**0**	**80.5**	**42.3**
H	**Outdoor** – AS – Approximately four feet above the ground outside of the RC.	1030 – 1034	4 Min.	**409**	**0**	**86.5**	**62.9**

Note: - All airborne CO_2 and CO concentrations are expressed in parts of contaminant per million parts of air (ppm)

Refer to Section 6.0, Equipment and Calibration Data, for the calibration data for the equipment used to perform the IAQ survey.

3.1.2 Airborne Lead Sampling

Air samples for lead were collected with personal air sampling pumps on 0.8 µm mixed cellulose ester (MCE) filters. All sampling pumps were calibrated before and after the sampling period with a primary gas flow standard. Area samples were collected as a part of this assessment. Following the assessment, the air samples and an appropriate number of field blanks were shipped via overnight courier to AMA Analytical (AMA) in Lanham, Maryland, which is accredited by the American Industrial Hygiene Association (AIHA) for analysis and participates in the Environmental Lead Accreditation Program (ELAP). The air samples were analyzed for lead using the EPA 600/R-93/200 Flame Atomic Absorption Spectroscopy (FAAS) method. All air sample results were reported in micrograms of lead per cubic meters of air sampled (µg/m^3) for the purposes of this assessment.

Air sample results for lead were compared to the Action Level and Permissible Exposure Limits (PELs) published in OSHA 1910.1025, the expanded health standard for lead. Action Levels and PELs are promulgated through the OSHA rule-making process and act as legal limits for exposure in the work place. They are intended to provide protection to employees who are potentially exposed to airborne contaminants. The Action Level for lead is expressed in terms of an 8-hour time-weighted average (TWA) contaminant concentration. The 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, "Greenbelt_RC_Medical."

TABLE 2

AIRBORNE LEAD SAMPLING RESULTS SUMMARY

Date of Monitoring:	July 22, 2008
Location:	Army National Guard RC, Greenbelt, 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
072208-A001	103	**SGT [redacted] Office** – Area Sample - Operator Breathing Height (AS-OBH) – During normal operations within the Greenbelt Armory.	0705	1422	437	1.99	874.0	<3.4 $\mu g/m^3$
072208-A002	104	**SFC [redacted] Office** –AS-OBH – During normal operations within the Greenbelt Armory.	0705	1422	437	1.99	883.0	<3.4 $\mu g/m^3$

Note: - Sample results for lead are expressed as micrograms contaminant per cubic meter of air ($\mu g/m^3$)
- PEL-TWA = OSHA Permissible Exposure Level, 8-Hour TWA

3.2 Lead Dust Sampling

IES performed wipe sampling in the Assembly 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 centimeters 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 C for complete laboratory wipe sample analysis results and Appendix D for the sample locations. Worksite Sampling Data Records are included in a separate document entitled, "Greenbelt_RC_Medical."

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TABLE 3 – WIPE SAMPLE RESULTS SUMMARY

Date of Monitoring:	July 22, 2008
Location:	Army National Guard RC, Greenbelt, Maryland
Analyte(s):	Lead
Occupational Exposure Limits:	ARNG Recommended Cleaning Level = 200 $\mu g/ft^2$

Sample ID	Location	Area of Surface Sampled	Measured Lead Surface Contamination ($\mu g/ft^2$)
072208-SW001	**Assembly Hall** -Wipe Sample (WS)- Top surface of bulletin board near Kitchen	100 cm^2	660
072208-SW002	**Assembly Hall** -WS-Top surface of electrical panel near garage	100 cm^2	150
072208-SW003	**Assembly Hall** -WS-Surface of floor at center court	100 cm^2	350
072208-SW004	**Kitchen** -WS-Surface of Piedmont refrigerator	100 cm^2	170
072208-SW005	**Copy/Mail Room** -WS-Surface of floor	100 cm^2	220
072208-SW006	**Conference Room 121** -WS-Surface of the center filing cabinet	100 cm^2	<110
072208-SW007	**Conference Room 121** -WS-Surface of the book shelf	100 cm^2	270
072208-SW008	**Conference Room 121** -WS-Surface of the top of the chalkboard	100 cm^2	460
072208-SW009	[redacted] **Office** -WS-Surface of filing cabinet	100 cm^2	<110
072208-SW010	[redacted] **Office** -WS-Surface of small refrigerator	100 cm^2	<110
072208-SW011	**Second Floor Conference Room** -WS-Surface of desk in front row	100 cm^2	<110
072208-SW012	**Second Floor Conference Room** -WS-Surface of cabinet	100 cm^2	160
072208-SW013	[redacted] **Office** -WS-Surface of filing cabinet	100 cm^2	<110
072208-SW014	[redacted] **Office** -WS-Surface of desk top	100 cm^2	<110
072208-SW015	**Quarters** -WS-Surface of table with microwave	100 cm^2	180
072208-SW016	**Converted IFR**-WS-Exhaust ventilation duct at the front of former IFR	100 cm^2	130
072208-SW017	**Converted IFR**-WS-Exhaust ventilation duct at the center of former IFR	100 cm^2	<110
072208-SW018	**Converted IFR** -WS-Floor at center of Locker area	100 cm^2	700
072208-SW019	**Converted IFR** -WS-Top of locker in the Supply section	100 cm^2	600
072208-SW020	**Converted IFR** -WS-Surface of floor outside of the former range	100 cm^2	520

3.3 Illuminance Survey

The illumination survey was performed pursuant to best Industrial Hygiene practices and the guidelines found in the ARNG document entitled, "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," dated November 17, 2007.(5) All measurements were made in slow response mode and were expressed in foot candles (fc). The measurements were used to calculate average illuminance levels for each workspace. Based on the activities conducted in each workspace, the calculated average illuminance level was compared to the ARNG recommended illuminance values. This report's findings are based on the illuminance readings collected during the survey, which are summarized in Table 4. The data reported in this table represent the average illuminance readings from the accessible locations of the commonly occupied work areas of the facility. Refer to the Illuminance Readings maps in Appendix E for sample locations.

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TABLE 4
ILLUMINANCE READINGS SUMMARY

Survey Dates: July 22, 2008
Location: Army National Guard RC, Greenbelt, Maryland

Sample ID	Sample Description	Average Illuminance Measurements (fc)	ARNG Recommended Illuminance Value (fc)
A	Lounge – Center of room	12.9	10
B	Assembly Hall – Center of Hall	21.2	10
C	Lobby Area – Center of Lobby	39.9	10
D	Hallway – Center of First Floor Hallway	39.9	5
E	[redacted] Office – Center of office	40.7	50
F	Conference Room – Center of Room	25.8	30
G	Second Floor Hallway – Center of Hallway	39.9	5
H	[redacted]' Office – Center of Office	107.0	50
I	Quarters – Center of Room	19.7	50
J	Class Room – Center of Room	25.6	50
K	Fire Support Team Office – Center of Office	35.6	50
L	Latrine – Center of latrine	34.2	7

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, "Greenbelt_RC_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, boiler room and the Copy/Mail Room within the facility. IES collected paint chip samples from these areas. IES also collected bulk building materials from the Copy/Mail Room to be analyzed for asbestos content. IES did not observe any mold growth or water-damaged materials that would be conducive for mold growth.

4.1.1 Deteriorating Paint Chip Sampling

IES performed a visual inspection of the building materials and observed deteriorating paint within the facility. IES collected three paint chip samples of various colors and substrates. The paint chip samples were shipped via overnight courier to AMA. The samples were analyzed for lead content

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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 22, 2008
Location: National Guard RC, Greenbelt, Maryland

Sample Number	Sample Location	Paint Color	Result
LBP-001	Painted Ceiling and Walls in Kitchen	White	0.28%
LBP-002	Painted Ceiling and Walls in Boiler Room	White	0.046%
LBP-003	Second Floor Ceiling	White	0.37%

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 one bulk sample of building materials. The sample was 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. A trace amount of asbestos was detected in the building material sample 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 F for the complete laboratory sample analysis results.

TABLE 6
ASBESTOS CONTAINING MATERIALS SAMPLING SUMMARY

Date of Assessment: July 22, 2008
Location: National Guard RC, Greenbelt, Maryland

Sample Number	Sample Location	Material Color	Result
ACM-001	9"x9" Floor Tile in Mail/Copy Room	Black	Trace

Notes: - Trace = Trace amount of asbestos was found in simple.

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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 walking surfaces were clear of hazards and objects above the head were secured safety to the wall or columns to reduce the risk of head injuries.

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	103	103
Personal Sampling Pump	MSA Escort ELF	104	104
Primary Gas Flow Calibrator (Electronic Frictionless Piston)	Bios DryCal DC-Lite Model DCL-HM; S/N 101785	DryCal-ML	DryCal-ML
Light Meter	Extech Light Meter	401025	401025
Indoor Air Quality Monitor	TSI Model 8551 Q-Trak	51885	Q-Trak

5.2 Sampling Equipment Calibration Data

Table 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)
103	DryCal-ML	7/22/08	2.01	7/22/08	1.99	2.00
104	DryCal-ML	7/22/08	2.02	7/22/08	2.02	2.02
DryCal-ML	Bench Calibrated 02/07/08	N/A	N/A	N/A	N/A	N/A
401025	NA	NA	NA	NA	NA	NA

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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)
Q-Trak	Zero Gas/ Span Gas	7/22/08	Zero Gas: 0 ppm CO_2; 0 ppm CO Span Gas 1,000 ppm CO_2; 35 ppm CO	7/22/08	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

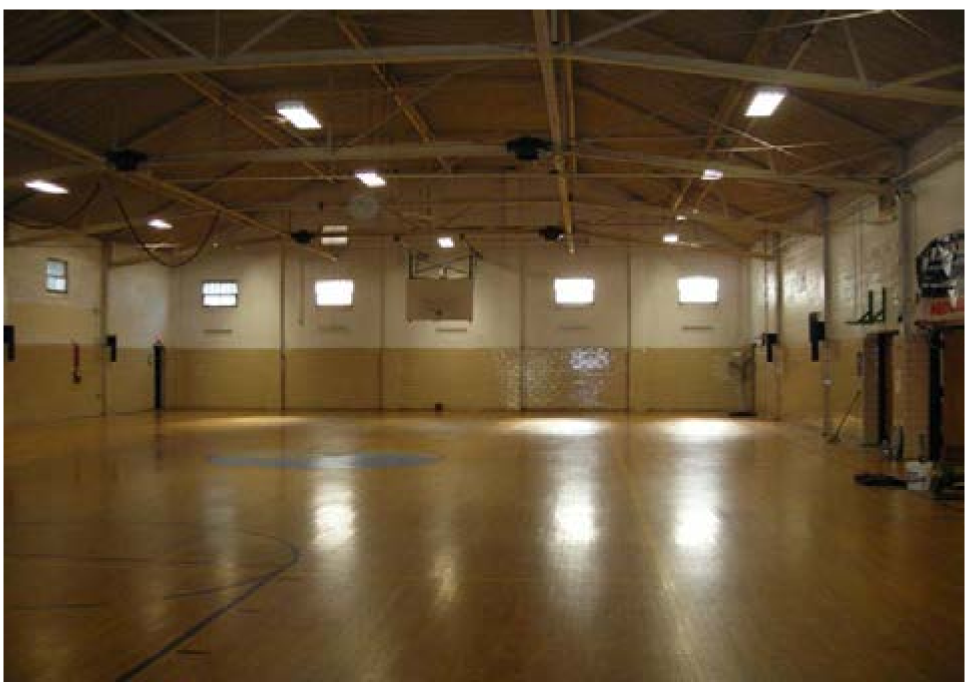
6.0 REFERENCES

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 – RC Assembly Hall

Photograph #3 – Converted Rifle Range

Photograph #4 – Chipping Paint in the Mail/Copy Room

Photograph #5 – Damaged 9” x 9” Floor Tiles

Photograph #6 – Cardboard Guarding Exposed Wiring

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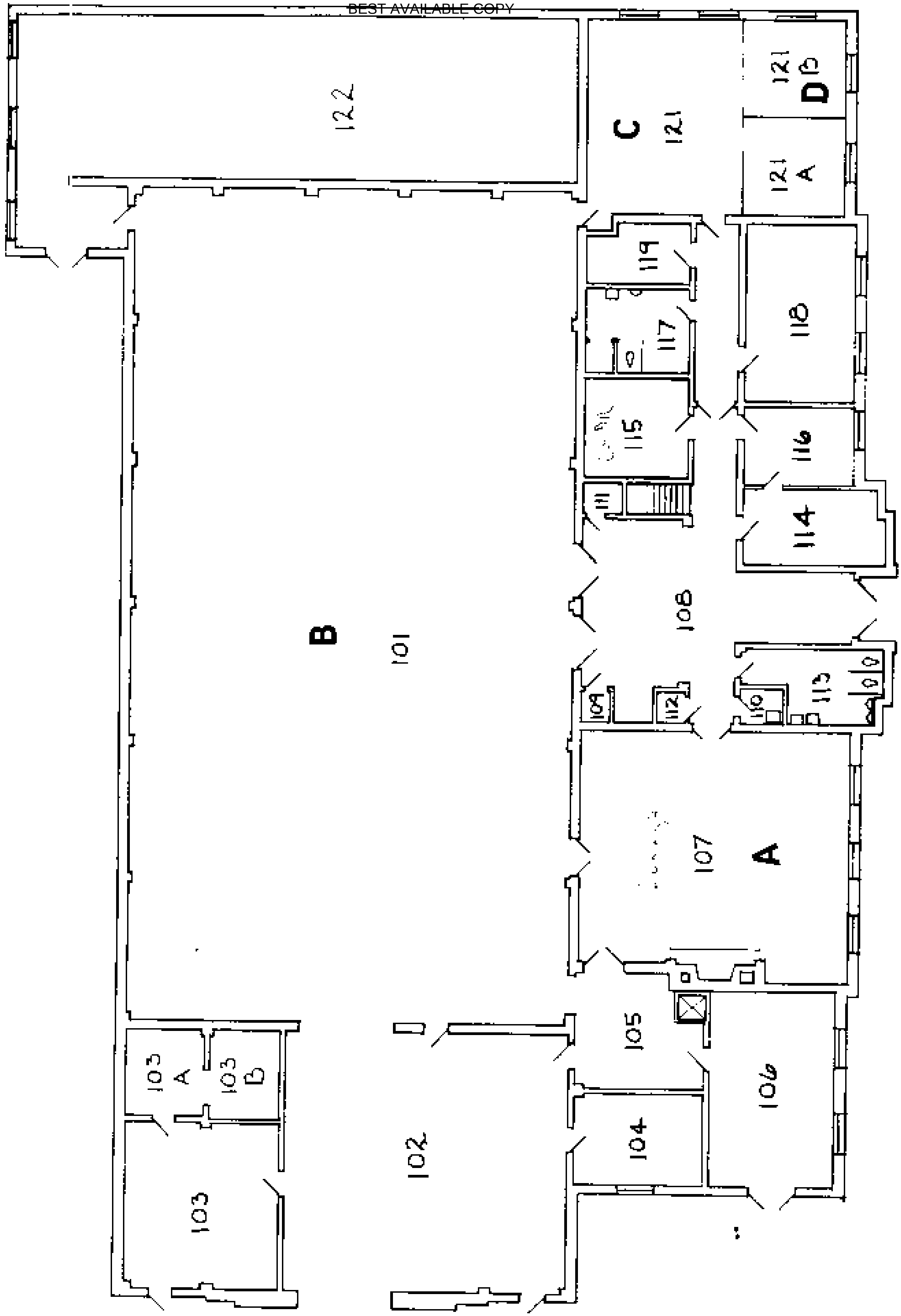
APPENDIX B

INDOOR AIR QUALITY SAMPLE LOCATION MAP

H

GREENBELT READINESS CENTER
IAQ SURVEY MAP

FIRST FLOOR PLAN
NO SCALE
24/10/95



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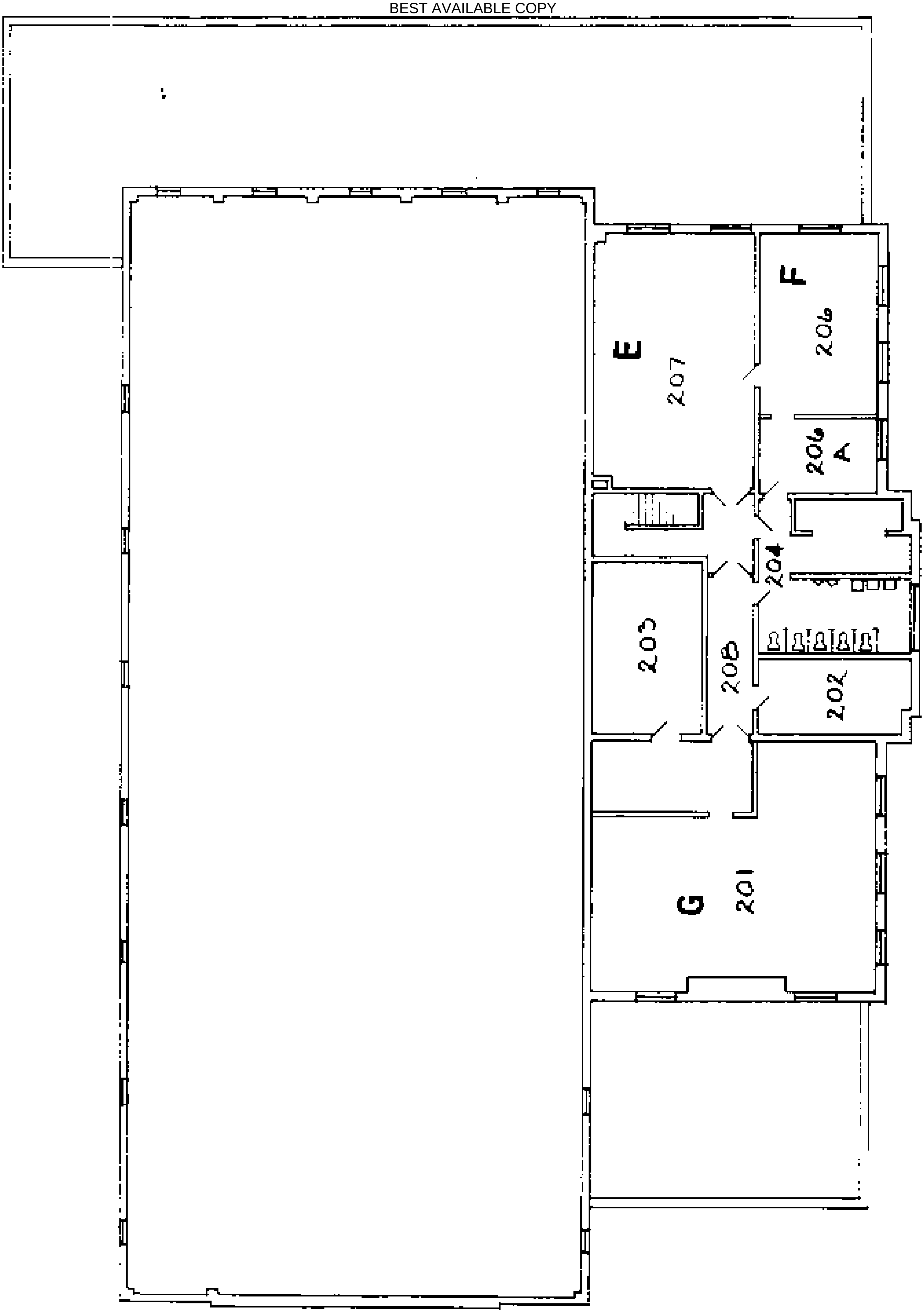

SECOND FLOOR PLAN
NO SCALE

24/10/95

GREENBELT READINESS CENTER
IAQ SURVEY MAP

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APPENDIX C

AIR, WIPE, AND PAINT CHIP SAMPLING RESULTS

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA Accredited Laboratory — Environmental Lead — See aihaqap.org for details — 100470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Not Provided	**Chain Of Custody:**	503008
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Silver Spring, MD	**Date Submitted:**	7/29/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EHS08794.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	8/1/2008
				Report Date:	8/4/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0874269	072208-A001	Flame	Air	874	N/A	3.43	ug/m³	<	3.4	ug/m³	
0874270	072208-A002	Flame	Air	883	N/A	3.40	ug/m³	<	3.4	ug/m³	
0874271	072208-A003	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	
0874272	LBP-001	Flame	Paint Chip	****	N/A	0.01	%Pb		0.28	%Pb	
0874273	LBP-002	Flame	Paint Chip	****	N/A	0.01	%Pb		0.046	%Pb	
0874274	LBP-003	Flame	Paint Chip	****	N/A	0.01	%Pb		0.37	%Pb	
0874275	072208-SW001	Flame	Wipe	****	0.108	111.52	ug/ft²		660	ug/ft²	
0874276	072208-SW002	Flame	Wipe	****	0.108	111.52	ug/ft²		150	ug/ft²	
0874277	072208-SW003	Flame	Wipe	****	0.108	111.52	ug/ft²		350	ug/ft²	
0874278	072208-SW004	Flame	Wipe	****	0.108	111.52	ug/ft²		170	ug/ft²	
0874279	072208-SW005	Flame	Wipe	****	0.108	111.52	ug/ft²		220	ug/ft²	
0874280	072208-SW006	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874281	072208-SW007	Flame	Wipe	****	0.108	111.52	ug/ft²		270	ug/ft²	
0874282	072208-SW008	Flame	Wipe	****	0.108	111.52	ug/ft²		460	ug/ft²	
0874283	072208-SW009	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874284	072208-SW010	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874285	072208-SW011	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874286	072208-SW012	Flame	Wipe	****	0.108	111.52	ug/ft²		160	ug/ft²	
0874287	072208-SW013	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA Environmental Lead 100470
NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Not Provided	**Chain Of Custody:**	503008
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Silver Spring, MD	**Date Submitted:**	7/29/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EHS08794.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	8/1/2008
Attention:	[redacted]			**Report Date:**	8/4/2008

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Final Result			Comments
0874288	072208-SW014	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874289	072208-SW015	Flame	Wipe	****	0.108	111.52	ug/ft²		180	ug/ft²	
0874290	072208-SW016	Flame	Wipe	****	0.108	111.52	ug/ft²		130	ug/ft²	
0874291	072208-SW017	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874292	072208-SW018	Flame	Wipe	****	0.108	111.52	ug/ft²		700	ug/ft²	
0874293	072208-SW019	Flame	Wipe	****	0.108	111.52	ug/ft²		600	ug/ft²	
0874294	072208-SW020	Flame	Wipe	****	0.108	111.52	ug/ft²		520	ug/ft²	
0874295	072208-SW021	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0874296	072208-SW022	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	

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

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

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

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

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

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

Air and Wipe results are not corrected for any blank results

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

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

Analyst: Melissa Sampson

Technical Manager: G Edward Carney

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* Bill the National Guard Bureau Region North 114 Office Directly

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

CHAIN OF CUSTODY

(Please Refer To T Number For Inqui **503008**

lcb

Mailing/Billing Information:
1. Client Name: JES Engineers
2. Address 1: 1720 Walton Rd
3. Address 2: Blue Bell, PA 19422
4. Address 3:
5. Phone #: 610 828 3078 Fax #: 610 828 7842

Submittal Information:
1. Job Name:
2. Job Location: Silver Spring, Md
3. Job #: EHS0879902 P.O. #:
4. Contact Person: [redacted] @ 610 828 3078
5. Submitted by: [redacted] Signature: [redacted]

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

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

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day +
☐ 2 Day Date Due: 8/12/08
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☐ Inclu[redacted]a Sheets with Report
☒ Emai[redacted] @ jesengineers.com
☐ Fax:
☐ Verbals:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☒ EPA 600 – Visual Estimate 1 (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)

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

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

Lead Analysis
☒ Paint Chip 3 (QTY)
☒ Dust Wipe (wipe type ghost wipe) 22 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid ____ (QTY)
☐ TCLP ____ (QTY)
☐ Drinking Water ____ (QTY)
☐ Waste Water ____ (QTY)
☐ Dust Wipe Furnace (wipe type ____) ____ (QTY)

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

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SHORL TRAP	TAPE	SWAB
072208-SW001		7/22/08		100in²				X				X				
072208 SW002								X				X				
072208-SW003								X				X				
072208 SW004								X				X				
072208-SW005								X				X				
072208 -SW006								X				X				
072208-SW007								X				X				
072208-SW008								X				X				
072208-SW009								X				X				
072208-SW010								X				X				
072208-SW011								X				X				

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

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 7/24/08 0930 Via: FedEx By (Print): Chris Nicodemus Sign: Chris Nicodemus
2. Date/Time Analyzed: __/__/__ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: __/__/__ Time: ____ Initials: ____
4. Comments:

* Bill the National Guard Bureau North 1H office Directly

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 5C3CC8 206

Mailing/Billing Information:
1. Client Name: IES Engineers
2. Address 1: 1720 Walton Rd
3. Address 2: Blue Bell, PA 19422
4. Address 3:
5. Phone #: 610 828 3078 Fax #: 610 828 7842

Submittal Information:
1. Job Name:
2. Job Location: Silver Spring, Md
3. Job #: EHS08794.07 P.O. #:
4. Contact Perso[redacted] @ phone # 610 828 3078
5. Submitted by [redacted] Signature:

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

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

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

REPORT TO:
❑ Includ[redacted]heets with Report
☒ Email[redacted] @ iesengineers.com
❑ Fax:
❑ Verbals:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
❑ NIOSH 7400________(QTY)
❑ Fiberglass________(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
❑ AHERA________(QTY)
❑ NIOSH 7402________(QTY)
❑ Other (specify________)________(QTY)
PLM Bulk
❑ EPA 600 – Visual Estimate________(QTY)
❑ EPA Point Count________(QTY)
❑ NY State Friable 198.1________(QTY)
❑ Grav. Reduction ELAP 198.6________(QTY)
❑ Other (specify________)________(QTY)

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

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

Lead Analysis
❑ Paint Chip________(QTY)
❑ Dust Wipe (wipe type________)________(QTY)
❑ Air________(QTY)
❑ Soil/Solid________(QTY)
❑ TCLP________(QTY)
❑ Drinking Water________(QTY)
❑ Waste Water________(QTY)
❑ Dust Wipe Furnace (wipe type________)________(QTY)

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

SAMPLE INFORMATION — **ANALYSIS** — **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
072208-SW012		7/22/08		100in²				X				X				
072208-SW013								X				X				
072208-SW014								X				X				
072208-SW015								X				X				
072208-SW016								X				X				
072208-SW017								X				X				
072208-SW018								X				X				
072208-SW019								X				X				
072208-SW020								X				X				
072208-SW021				—				X				X				
072208-SW022				—				X				X				

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

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

BEST AVAILABLE COPY

* Bill the National Guard Bureau Region North IH office Directly

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 503008 ~~503~~ 2 of 6

Mailing/Billing Information:
1. Client Name: IES Engineers
2. Address 1: 1720 Walton Rd
3. Address 2: Blue Bell, PA 19422
4. Address 3:
5. Phone #: 610 828 3078 Fax #: 610 828 7842

Submittal Information:
1. Job Name:
2. Job Location: Silver Spring, MD
3. Job #: EHS087941.02 P.O. #:
4. Contact Perso[redacted] @ [redacted] 610 828 3078
5. Submitted by: [redacted] Signature: [redacted]

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

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

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

REPORT TO:
☐ Inclu[redacted] Sheets with Report
☒ Email [redacted] @ iesengineers.com
☐ Fax:
☐ Verbal:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ______ in a 25mm 37mm
☐ NIOSH 7400 ________ (QTY)
☐ Fiberglass ________ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ______ in a 25mm 37mm
☐ AHERA ________ (QTY)
☐ NIOSH 7402 ________ (QTY)
☐ Other (specify ________) ________ (QTY)
PLM Bulk
☒ EPA 600 – Visual Estimate 1 (QTY)
☐ EPA Point Count ________ (QTY)
☐ NY State Friable 198.1 ________ (QTY)
☐ Grav. Reduction ELAP 198.6 ________ (QTY)
☐ Other (specify ________) ________ (QTY)

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

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

Lead Analysis
☒ Paint Chip 3 (QTY)
☒ Dust Wipe (wipe type ghostwipe) 22 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid ________ (QTY)
☐ TCLP ________ (QTY)
☐ Drinking Water ________ (QTY)
☐ Waste Water ________ (QTY)
☐ Dust Wipe Furnace (wipe type ________) ________ (QTY)

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

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
LBP-001		7/22/08						X			X						Date/Time: Contact: By:
LBP-002								X			X						
LBP-003								X			X						
ACM-001	Floor Tile						X				X						
072208-A001			874.0					X		X							Date/Time: Contact: By:
072208-A002			882.7					X		X							
072208-A003			—					X		X							
																	Date/Time: Contact: By:

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

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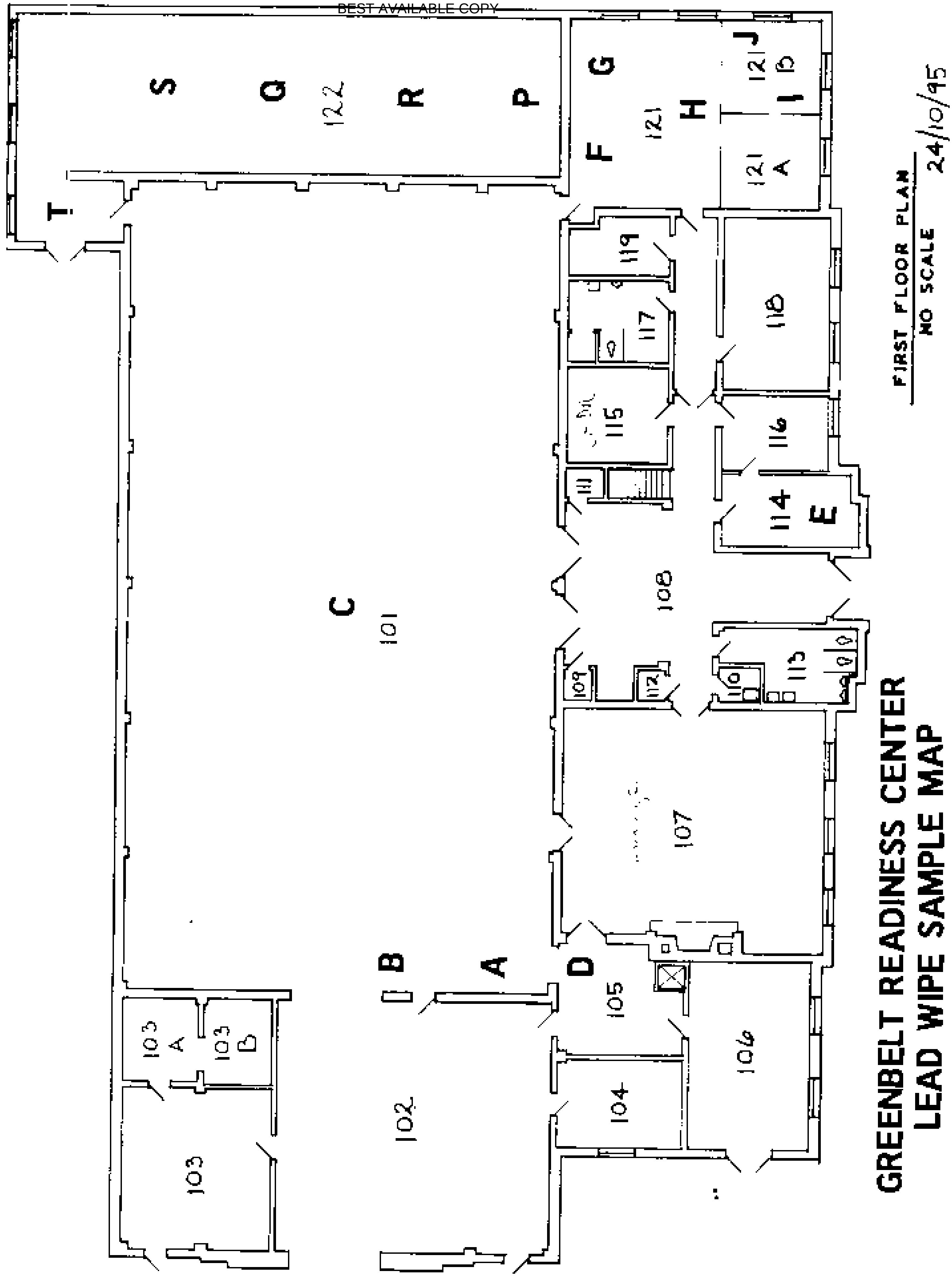
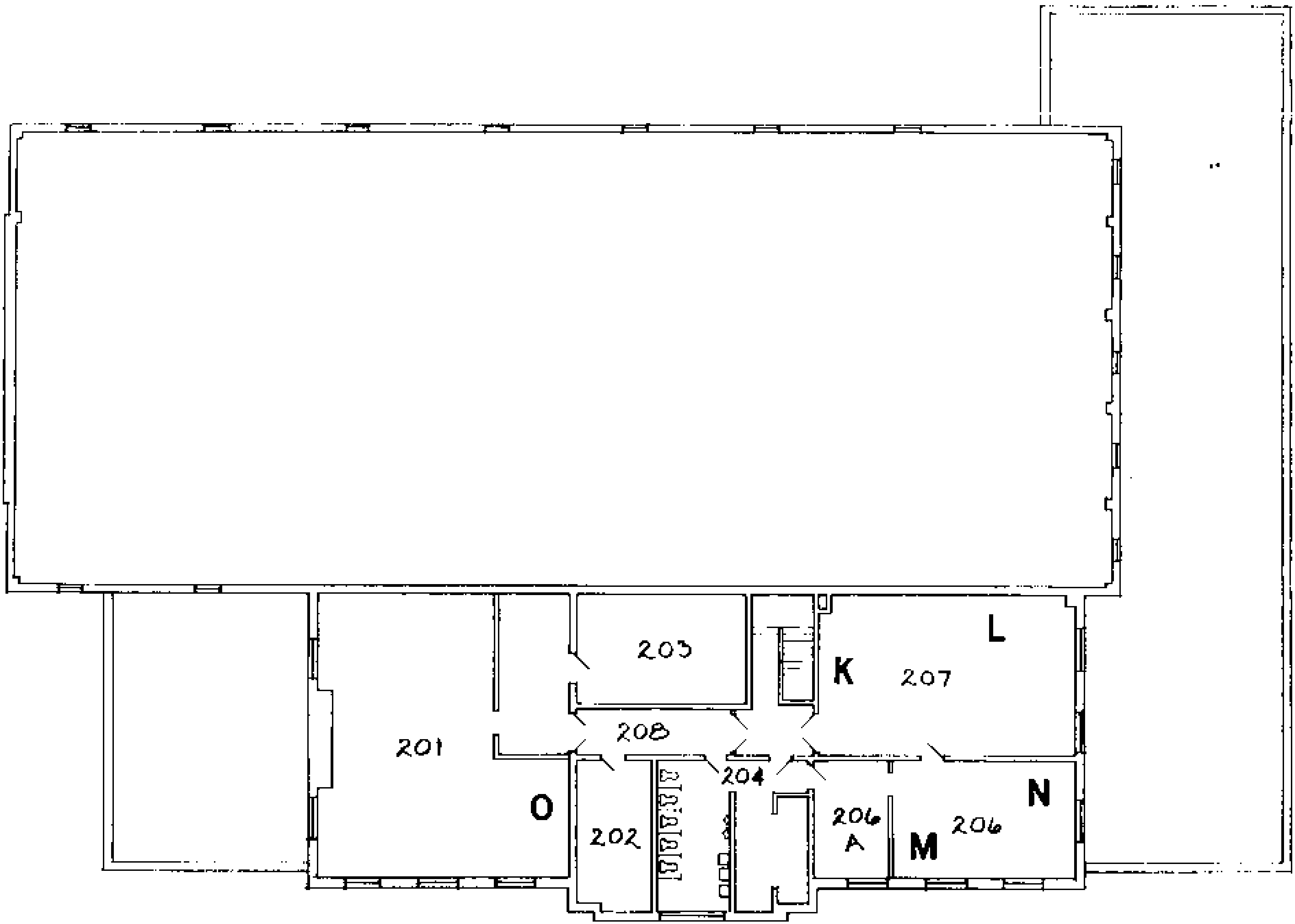
ENGINEERS

APPENDIX D

WIPE SAMPLING LOCATION MAP



BEST AVAILABLE COPY



GREENBELT READINESS CENTER
LEAD WIPE SAMPLE MAP

SECOND FLOOR PLAN
NO SCALE

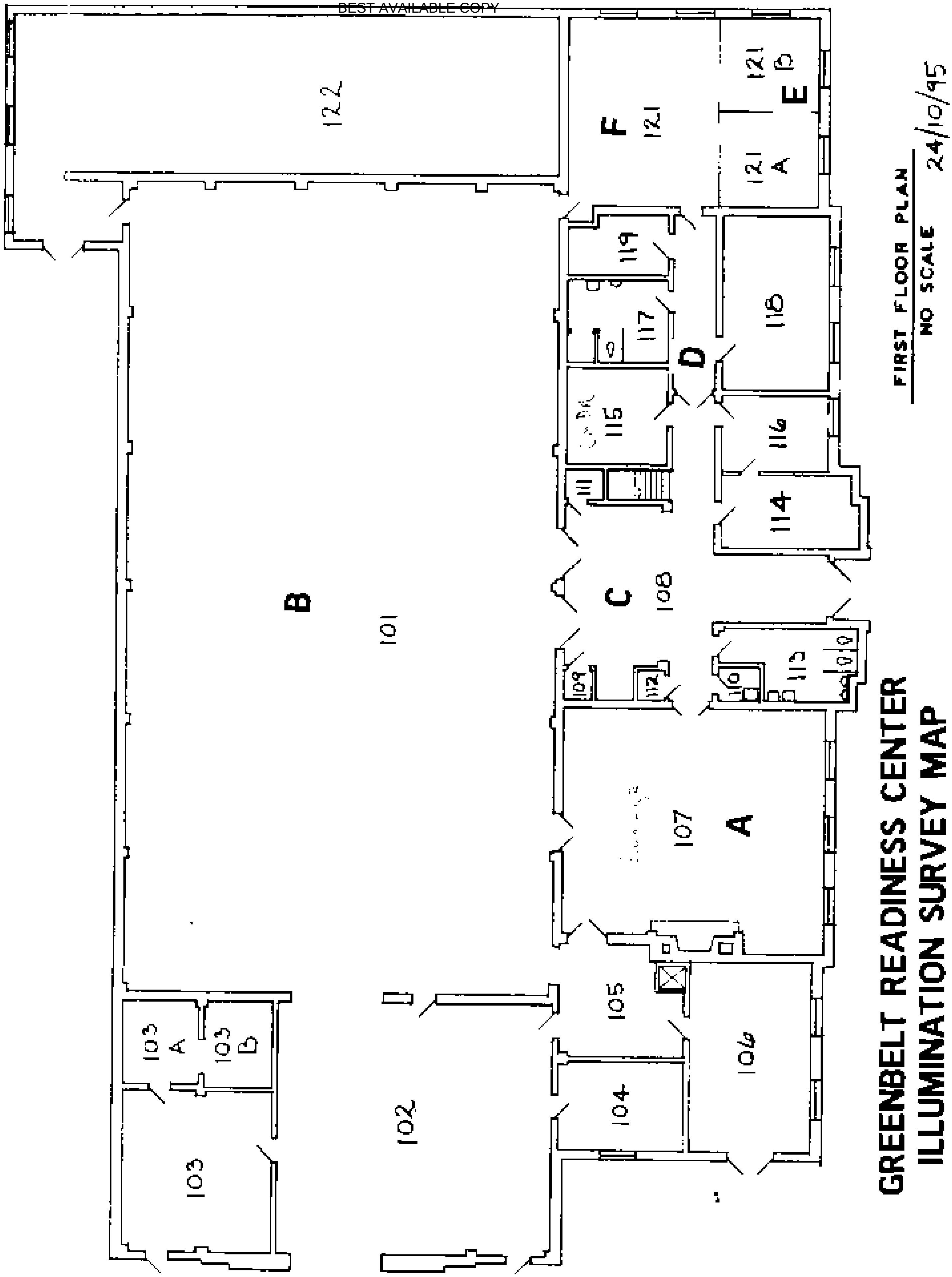
24/10/95

BEST AVAILABLE COPY

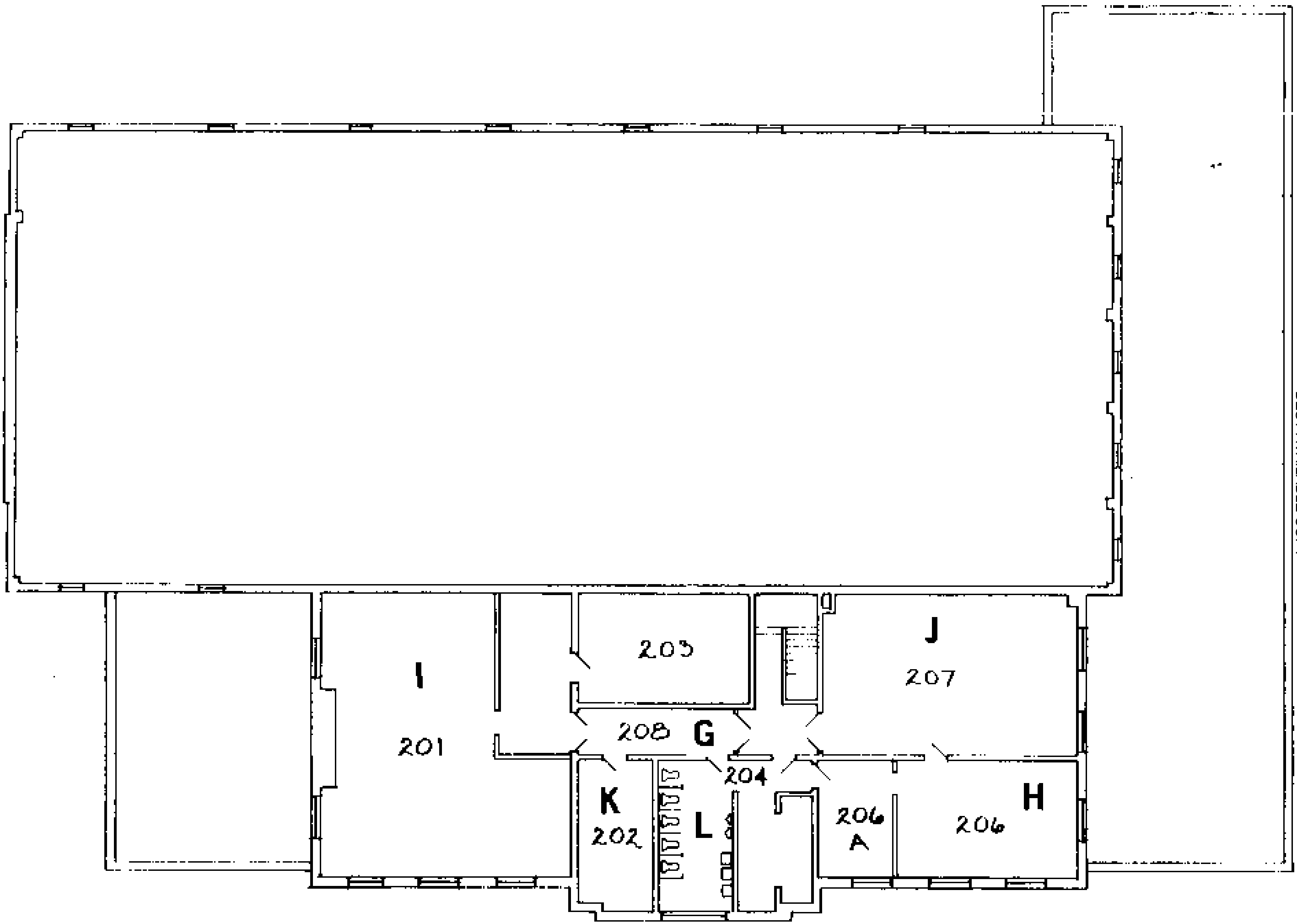
ENGINEERS

APPENDIX E

ILLUMINANCE READING MAP



BEST AVAILABLE COPY



GREENBELT READINESS CENTER ILLUMINATION SURVEY MAP

SECOND FLOOR PLAN
NO SCALE

24/10/95

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ENGINEERS

APPENDIX F

ASBESTOS SAMPLE RESULTS

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

Client:	National Guard Bureau	**Job Name:**	Not Provided	**Chain Of Custody:**	503008
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Silver Spring, MD	**Date Analyzed:**	8/1/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EHS08794.02	**Person Submitting:**	Non-Responsive [redacted]
		P.O. Number:	Not Provided		

Attention: Non-Responsive [redacted]

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Color	Homogeneity	Analyst ID	Comments
0874297	ACM-001	TR [1]	TR	--	--	--	--	--	--	--	--	100	Black	Homogeneous	LBP	

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

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

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

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

Lom Butruk

Lom Butruk

An AIHA (#100470), NVLAP (101 BEST AVAILABLE COPY #109201) Accredited Laboratory
4475 Forbes Blvd. · Lanham, MD. 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

* Bill the National Guard Bureau Karen North 1H office Directly

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

CHAIN OF CUSTODY

(Please Refer To T Number For Inqui

503008

1cb

Mailing/Billing Information:

1. Client Name: JES Engineers
2. Address 1: 1720 Walton Rd
3. Address 2: Blue Bell, PA 19422
4. Address 3:
5. Phone #: 610 828 3078 Fax #: 610 828 7842

Submittal Information:

1. Job Name:
2. Job Location: Silver Spring Yd
3. Job #: EHSOE794.02 P.O. #:
4. Contact Person: [redacted] @ phone #: 610 828 3078
5. Submitted by: [redacted] Signature: [redacted]

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

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ Immediate Date Due: ❑ 24 Hours Time Due: Comments:	❑ Immediate ❑ Next Day ❑ 2 Day ❑ 3 Day ☒ 5 Day • Date Due: 8/1/08 ❑ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	❑ Include COC/Field Data Sheets with Report ☒ Email: [redacted] @ jesengineers.com ❑ Fax: ❑ Verbals:

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
❑ NIOSH 7400 ____ (QTY)
❑ Fiberglass ____ (QTY)

TEM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
❑ AHERA ____ (QTY)
❑ NIOSH 7402 ____ (QTY)
❑ Other (specify ____) ____ (QTY)

PLM Bulk
☒ EPA 600 – Visual Estimate 1 (QTY)
❑ EPA Point Count ____ (QTY)
❑ NY State Friable 198.1 ____ (QTY)
❑ Grav. Reduction ELAP 198.6 ____ (QTY)
❑ Other (specify ____) ____ (QTY)

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

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

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

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

Lead Analysis
☒ Paint Chip 3 (QTY)
☒ Dust Wipe (wipe type Ghost wipe) 22 (QTY)
☒ Air 3 (QTY)
❑ Soil/Solid ____ (QTY)
❑ TCLP ____ (QTY)
❑ Drinking Water ____ (QTY)
❑ Waste Water ____ (QTY)
❑ Dust Wipe Furnace (wipe type ____) ____ (QTY)

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

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
072208-SW001		7/22/08		100in²				X				X				
072208-SW002								X				X				
072208-SW003								X				X				
072208-SW004								X				X				
072208-SW005								X				X				
072208-SW006								X				X				
072208-SW007								X				X				
072208-SW008								X				X				
072208-SW009								X				X				
072208-SW010								X				X				
072208-SW011								X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time: Contact: By:

Date/Time: Contact: By:

Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)

1. Date/Time RCVD: 7/24/08 0930 Via: FedEx By (Print): Chris Niccolai Sign: Chris Niccolai
2. Date/Time Analyzed: 8/5/08 @ 14:45 By (Print): Lom Butruk Sign: Lom Butruk
3. Results Reported To: Joe Rambo Via: Fax, Email Date: 8/5/08 Time: Initials: LBP
4. Comments:

* Bill the National Guard Bureau North 1H office Directly

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 5C3008 246

Mailing/Billing Information:
1. Client Name: IES Engineers
2. Address 1: 1720 Walton Rd
3. Address 2: Blue Bell, PA 19422
4. Address 3:
5. Phone #: 610 828 3078 Fax #: 610 828 7842

Submittal Information:
1. Job Name:
2. Job Location: Silver Spring MD
3. Job #: EHS08794.02 P.O. #:
4. Contact Pers[redacted] @ phone # 610 828 3078
5. Submitted by[redacted] Signature:

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

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

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

REPORT TO:
☐ Include COC/Field Data Sheets with Report
☒ Email [redacted] @ iesengineers.com
☐ Fax:
☐ Verbals:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)

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

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

Lead Analysis
☐ Paint Chip ____ (QTY)
☐ Dust Wipe (wipe type ____) ____ (QTY)
☐ Air ____ (QTY)
☐ Soil/Solid ____ (QTY)
☐ TCLP ____ (QTY)
☐ Drinking Water ____ (QTY)
☐ Waste Water ____ (QTY)
☐ Dust Wipe Furnace (wipe type ____) ____ (QTY)

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

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
072208-SW012		7/22/08		100in²				X				X					Date/Time: Contact: By:
072208-SW013								X				X					
072208-SW014								X				X					
072208-SW015								X				X					
072208-SW016								X				X					Date/Time: Contact: By:
072208-SW017								X				X					
072208-SW018								X				X					
072208-SW019								X				X					
072208-SW020								X				X					Date/Time: Contact: By:
072208-SW021				—				X				X					
072208-SW022				—				X				X					

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

* Bill the National Guard Bureau Regional Health IH office Directly

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AMA Analytical Services, Inc.
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
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www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 503008 3 of 6

Mailing/Billing Information:

1. Client Name: IES Engineers
2. Address 1: 1720 Walton Rd
3. Address 2: Blue Bell, PA 19422
4. Address 3:
5. Phone #: 610 828 3078 Fax #: 610 828 7842

Submittal Information:

1. Job Name:
2. Job Location: Silver Spring, Md
3. Job #: EHS 08194.02 P.O. #:
4. Contact Person: [redacted] @ phone #: 610 828 3078
5. Submitted by: [redacted] Signature: [redacted]

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

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ______ ☐ 24 Hours Time Due: ______ Comments: ______	☐ Immediate ☐ 3 Day ☐ Next Day ☒ 5 Day + ☐ 2 Day Date Due: ______ ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☐ Include COC/Field Data Sheets with Report ☒ Email [redacted] @ iesengineers.com ☐ Fax: ______ ☐ Verbals: ______

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ NIOSH 7400 ________ (QTY)
☐ Fiberglass ________ (QTY)

TEM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ AHERA ________ (QTY)
☐ NIOSH 7402 ________ (QTY)
☐ Other (specify________) ________ (QTY)

PLM Bulk
☒ EPA 600 - Visual Estimate 1 (QTY)
☐ EPA Point Count ________ (QTY)
☐ NY State Friable 198.1 ________ (QTY)
☐ Grav. Reduction ELAP 198.6 ________ (QTY)
☐ Other (specify________) ________ (QTY)

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

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

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

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

Lead Analysis
☒ Paint Chip 3 (QTY)
☒ Dust Wipe (wipe type ghostwipe) 22 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid ________ (QTY)
☐ TCLP ________ (QTY)
☐ Drinking Water ________ (QTY)
☐ Waste Water ________ (QTY)
☐ Dust Wipe Furnace (wipe type ________) ________ (QTY)

Mold - Direct Microscopic Analysis
☐ Spore-Trap ____ (QTY) ☐ Bulk ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Other (Specify____) ____ (QTY)

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT
LBP-001		7/22/08						X			X						Date/Time: Contact: By:
LBP-002								X			X						
LBP-003								X			X						
ACM-001	Floor Tile						X				X						
072208-A001			874.0					X		X							Date/Time: Contact: By:
072208-A002			882.7					X		X							
072208-A003			—					X		X							
																	Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)

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

ANALYTICAL LABORATORY SERVICES, INC.
Environmental ✦ Industrial Hygiene ✦ Field Services
www.analyticallab.com

Industrial Hygiene Survey

National Guard Facility
Greenbelt Armory
7100 Greenbelt Road
Greenbelt, MD 20770

Prepared For:	National Guard Bureau Region North IH 301-IH Old Bay Lane Havre de Grace, MD 21078
Survey Location:	Greenbelt Armory 7100 Greenbelt Road Greenbelt, MD 20770
Prepared By:	Analytical Laboratory Services, Inc. 3544 North Progress Avenue Suite 100 Harrisburg, PA 17110
Survey Date:	September 2, 2010
Report Date:	October 13, 2010
ALSI Project #:	1009572

Non-Responsive [redacted]

Non-Responsive [redacted] CIH
Director, Environmental Health & Safety

Table of Contents

Section 1.0
Executive Summary

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on September 2, 2010, at the Greenbelt Armory located at 7100 Greenbelt Road, Greenbelt, MD 20770. The survey was performed by Ms. [redacted] and Mr. [redacted]

1. Lead surface and air samples were collected. All sample results were less than recommended guidelines or regulatory standards.

2. Lighting levels met the minimum recommended guidelines in all tested locations except for the Maintenance Office. 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. Relative humidity exceeded the recommended ceiling of 60% in one location and temperature was higher than the recommended criteria of 73 degrees F in all tested locations. Relative humidity should be maintained at 30-60%. Low relative humidity can lead to the drying of mucous tissues and an increased susceptibility to respiratory infection. High relative humidity can provide an environment suitable for microbial growth and proliferation.

4. Water damaged ceilings, walls, and roof leaks are present in a few areas. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

5. Damaged, suspect asbestos containing floor tile were observed in the lounge and maintenance office. Damaged areas of suspect asbestos containing material should be properly abated or repaired.

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Section 2.0
Operation Description & Observations

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Section 2.0 Operation Description & Observations

The Greenbelt Armory is mainly an administrative facility with many offices, training and storage areas. There were approximately 10 full-time employees stationed at this facility at the time of this survey.

The building was initially constructed in 1954. In 2009 a large storage area was added to the building. The exterior is brick and masonry. The interior walls are primarily block, plaster, or drywall. The floors are concrete with some vinyl floor tile.

There is no central heating, ventilating, and air conditioning system (HVAC) present. A few air conditioners are present in the building. Outdoor air ventilation occurs via open doors and windows. Some doors and windows were open on the day of this survey.

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 weight/exercise room.

There is no child-care facility in the building.

Overall housekeeping was poor. Some areas were dirty and cluttered. Housekeeping should be improved.

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

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Section 3.0
Noise Survey

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Section 3.0 Noise Survey

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

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Section 4.0
Lead Testing

Section 4.0 Lead Testing

At the time of the assessment, no activities were observed which would generate lead exposure. The facility contains an area which was once an indoor firing range. It has been fully abated and is now a weight room.

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/m³	Surface ug/ft²	Paint Chip %Pb
1	Drill Hall	<3.4		
2	First Floor Conference Room	<3.3		
3	Blank	<3 (ug)		
4	Lounge - Floor		<110	
5	Drill Hall – Floor (Left)		<110	
6	Drill Hall – Floor Outside Converted Firing Range		<110	
7	Drill Hall – Top of Ceramic Block Lower Wall		130	
8	Drill Hall – Floor (Center)		<110	
9	Maintenance Office – Desktop		120	
10	Kitchen – Top of Stove		<110	
11	Weight Room Converted Firing Range - Window Sill		<110	
12	Converted Firing Range – Floor by Equipment		<110	
13	Converted Firing Range - Top of Light		<110	
14	Conference Room - Top of Baseboard Heater		<110	
15	Recruit Office – Top of Cubicle Shelf		<110	
16	Entry – Floor		<110	
17	Second Floor Classroom - Window Sill		<110	
18	Blank		<12 (ug)	
Criteria		**50**	**200**	**0.5**

Key: **Bolded** results exceed listed criteria

Lead surface and air samples were collected. Surface levels of lead did not exceeded 200 ug/ft² in any areas sampled.

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

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

Deteriorated paint was observed in a few locations throughout the facility. Delaminated paint was mostly due to water leaks or age along with prolonged exposure to elevated relative humidity levels.

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Section 5.0
Lighting

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Section 5.0 Lighting

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

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Lounge/Game Room	60.5	30-50	Yes
Drill Hall	51.3	30-50	Yes
Readiness NCO	74.2	30-50	Yes
Training NCO	41.2	30-50	Yes
Conference Room	48.8	30-50	Yes
Unit Supply NCO	42.2	30-50	Yes
Large Back Supply Room	42.8	30-50	Yes
Kitchen	57.9	50	Yes
Maintenance Office	**21.7**	30-50	No
Weight Room – Converted Firing Range	83.3	30	Yes
Second Floor Classroom	86.1	30-50	Yes
Second Floor Office with Cubicles	76.6	30-50	Yes

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

Section 6.0
Indoor Air Quality

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Section 6.0 Indoor Air Quality

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

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

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 83.3 to 89.1 degrees F with relative humidity readings ranging from 47.6% to 60.7%. During the survey, carbon dioxide (CO_2) levels ranged from 434 ppm to 554 ppm within the facility compared to an outdoor CO_2 level of 439 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,139 ppm (439 ppm + 700 ppm). Carbon monoxide (CO) ranged from 0.5 – 3.5 ppm.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	91.0	51.1	449	1.8
Lounge/Game Room	**89.1**	47.6	516	3.5
Drill Hall	**84.7**	54.7	448	2.1
Readiness NCO	**84.0**	51.3	495	2.0
Training NCO	**84.0**	52.1	554	1.5
Conference Room	**84.7**	55.4	468	1.5
Unit Supply NCO	**84.7**	51.9	528	1.2
Large Back Supply Room	**83.7**	57.0	439	1.3
Kitchen	**83.3**	58.8	434	1.0
Maintenance Office	**83.5**	56.0	464	1.3
Weight Room Converted Firing Range	**83.8**	**60.7**	523	1.2
Second Floor Classroom	**86.9**	57.4	464	0.5
Second Floor Office with cubicles	**88.0**	53.2	437	1.1
Outdoors	91.3	53.6	429	0.8
Criteria	**73.0-79.0**	**30-60**	**<1,139**	**<9.0**

Key: **Bolded** results exceed listed criteria

Relative humidity exceeded the recommended ceiling of 60% in one location. Temperature exceeded the recommended criteria of 73 degrees F in all indoor locations. There is no central air conditioning system in the building. There are a few window or portable air-conditioners in the 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.

Carbon dioxide levels did not exceed the recommended ceiling of 1,139 ppm. This suggests that outdoor air ventilation is adequate in this area. There is no mechanical ventilation system for this facility. Outdoor air ventilation is provided by open windows and doors.

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 a few areas. Paint is peeling on the Drill Hall wall. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

2. No visible fungal growth was observed.

3. There is no central air-conditioning in the building.

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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 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 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:

1. 9"x 9" green and black vinyl floor tile are present in many areas. An estimated 4,000 – 5,000 ft^2 of this floor tile was observed.

2. Damaged floor tile were observed in the lounge and maintenance office. Damaged areas of suspect ACM should be properly abated or repaired.

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Section 8.0
Maintenance Bay

Section 8.0 Maintenance Bay

There is no garage area at this facility.

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Section 9.0
Limitations

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Section 9.0 Limitations

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

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

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Appendix A
Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	BG John R. Kenly	**Chain Of Custody:**	508722
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Greenbelt, MD	**Date Submitted:**	9/9/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	9/16/2010
Attention:	[redacted]			**Report Date:**	9/16/2010

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
1077278	1009572-1	Flame	Air	887	N/A	3.4	ug/m³	<3	<3.4	ug/m³	
1077279	1009572-2	Flame	Air	901	N/A	3.3	ug/m³	<3	<3.3	ug/m³	
1077280	1009572-3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1077281	1009572-4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1077282	1009572-5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1077283	1009572-6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1077284	1009572-7	Flame	Wipe	****	0.108	110	ug/ft²	14	130	ug/ft²	
1077285	1009572-8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1077286	1009572-9	Flame	Wipe	****	0.108	110	ug/ft²	13	120	ug/ft²	
1077287	1009572-10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1077288	1009572-11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1077289	1009572-12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1077290	1009572-13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1077291	1009572-14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1077292	1009572-15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1077293	1009572-16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1077294	1009572-17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1077295	1009572-18	Flame	Wipe	****	N/A	12	ug	<12	<12	ug	

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

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

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

LAP #108470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	BG John R. Kenly	**Chain Of Custody:**	508722
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Greenbelt, MD	**Date Submitted:**	9/9/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	9/16/2010 **Report Date:** 9/16/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

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

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)
%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.

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

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information not verified by this laboratory.

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

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

Lom Butruk

Analyst: Lom Butruk

Technical Manager: G Edward Carney

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Page 1 of 2

OWI (410) 347-2924 159202 210 REV. 6.08

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **508722**

p 1/2

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

Submittal Information:
1. Job Name: ~~Greenbelt~~ BG John R. Kenly
2. Job Location: Greenbelt, MD
3. Job #: [redacted] W912K6-09-A-0003
4. Contact Person: [redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted] Signature: [redacted]

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

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

NORMAL BUSINESS HOURS
☐ Immediate ☐ Next Day ☐ 2 Day
☐ 3 Day ☒ 5 Day + 9/16/10 Date Due:
☐ Results Required By Noon (Every Attempt Will Be Made to Accommodate)

REPORT TO:
☒ Include with Report [redacted] @analyticallab.com
☒ Email [redacted] @us.army.mil
☐ Fax [redacted] @us.army.mil
☐ Verbal

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

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

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

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 15 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WIPE	SOIL	TAPE	SWAB
1009572-1	Drill Hall	9/2	880.95					X		X						
1009572-2	1st Fl. Conference Rm.		900.98					X		X						
1009572-3	Blank		0					X		X						
1009572-4	Lounge Fl			100cm²				X				X				
1009572-5	Drill Hall Fl (L)							X				X				
1009572-6	Drill Hall Fl Outside Firing Range							X				X				
1009572-7	Drill Hall Top of Range Beam							X				X				
1009572-8	Drill Hall Fl Center							X				X				
1009572-9	Maintenance Office Desk							X				X				
1009572-10	Kitchen Top of Stove							X				X				
1009572-11	Wght Rm - Win Sill							X				X				
1009572-12	Converted Firing Range							X				X				

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

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 9 / 9 / 10 @ 930 Via: UPS By (Print): Nicole Maxwell Sign: [signature]
2. Date/Time Analyzed: ___ / ___ / ___ @ ___ By (Print): ___ Sign: ___
3. Results Reported To: ___ Via: ___ Date: ___ / ___ / ___ Time: ___ Initials: ___
4. Comments:

Page 2 of 2

CWO (410) 247-2024 · 150202 · 210 REV. 6.08

508722
p2/2

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

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

Submittal Information:
1. Job Name: BG John R. Kealy
2. Job Location: Greenbelt, MD
3. Job #: [redacted] PO #: W912K6-09-A-0003
4. Contact Perso[redacted]
5. Submitted by: [redacted]

Reporting Information (Results will be provided[redacted]

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

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

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

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

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM __(Qual) PLM__(Quant) PLM/TEM__(Qual) PLM/TEM__(Quant)

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

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

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

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

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

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

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	SWAB AND WATER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
1009572-13	Converted Barracks Light	9/3		100cm²				X				X					Date/Time: Contact: By:
1009572-14	Conference Rm-Breakroom Heater	↓		↓				X				X					
1009572-15	Recruit Office-Shelf							X				X					
1009572-16	Entry Floor							X				X					
1009572-17	2nd Fl Classroom Window sill			↓				X				X					Date/Time: Contact: By:
1009572-18	Blank	↓		0cm²				X				X					
																	Date/Time: Contact: By:

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

Appendix B
Photographs

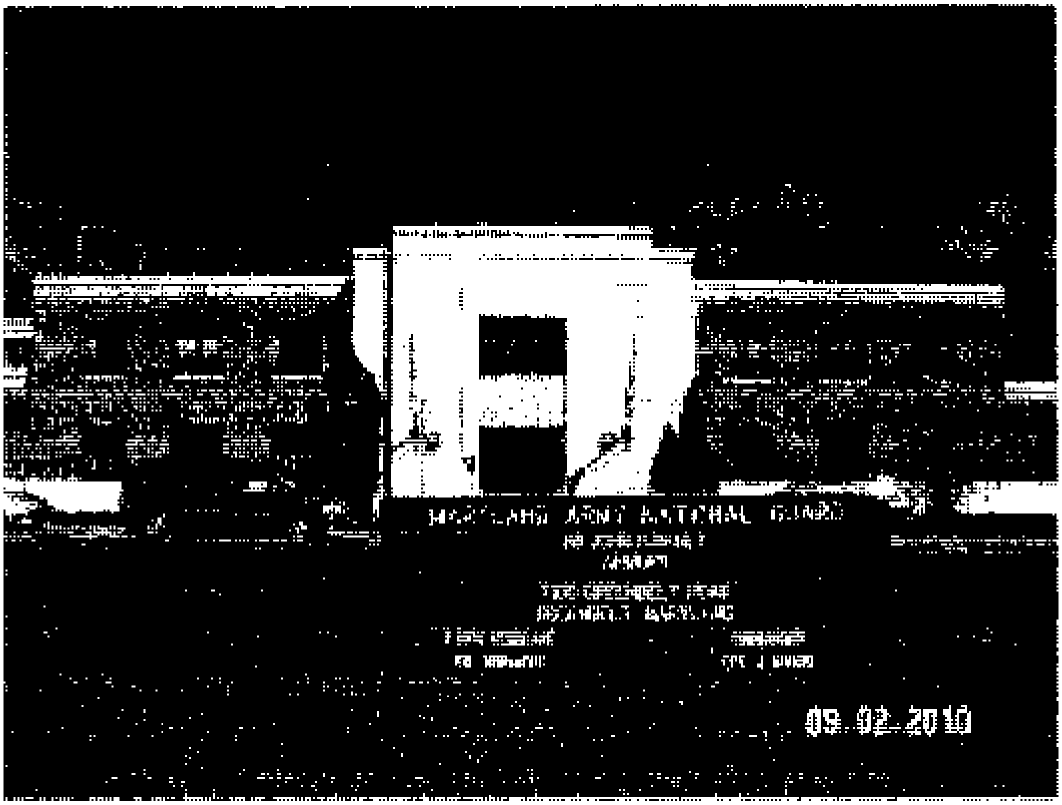

Photo 1: Exterior view

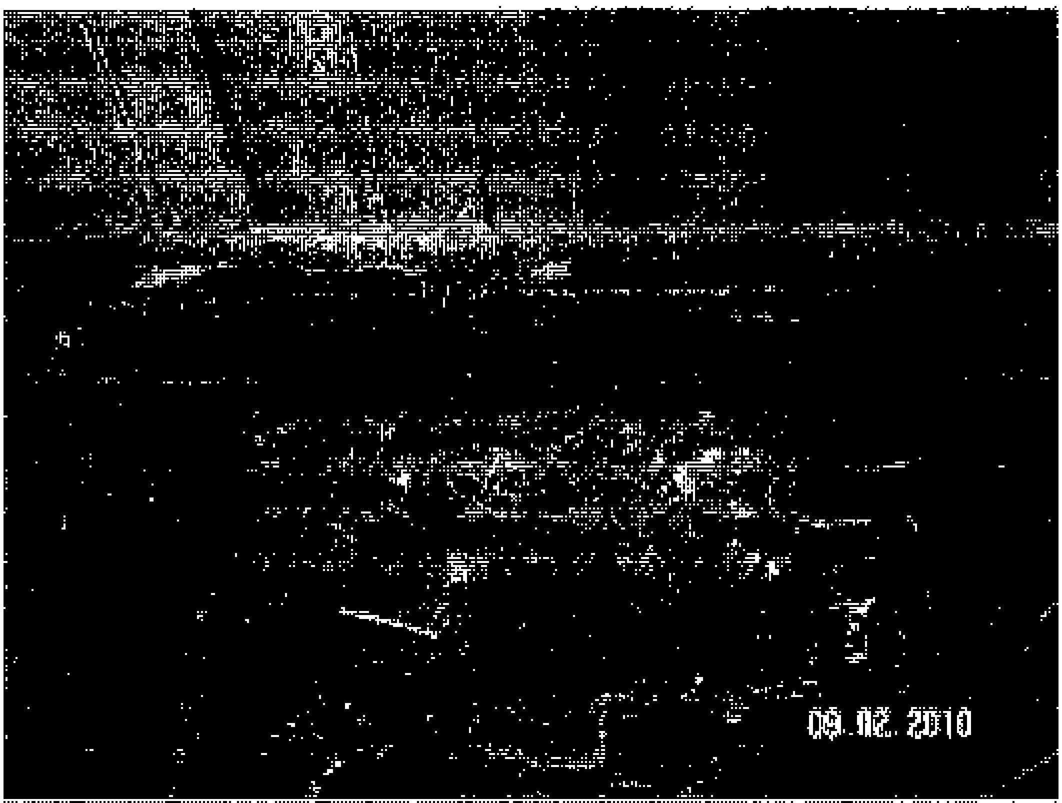

Photo 2: Damaged 9 x 9 vinyl floor tile in lounge

Photo 3: Drill Hall

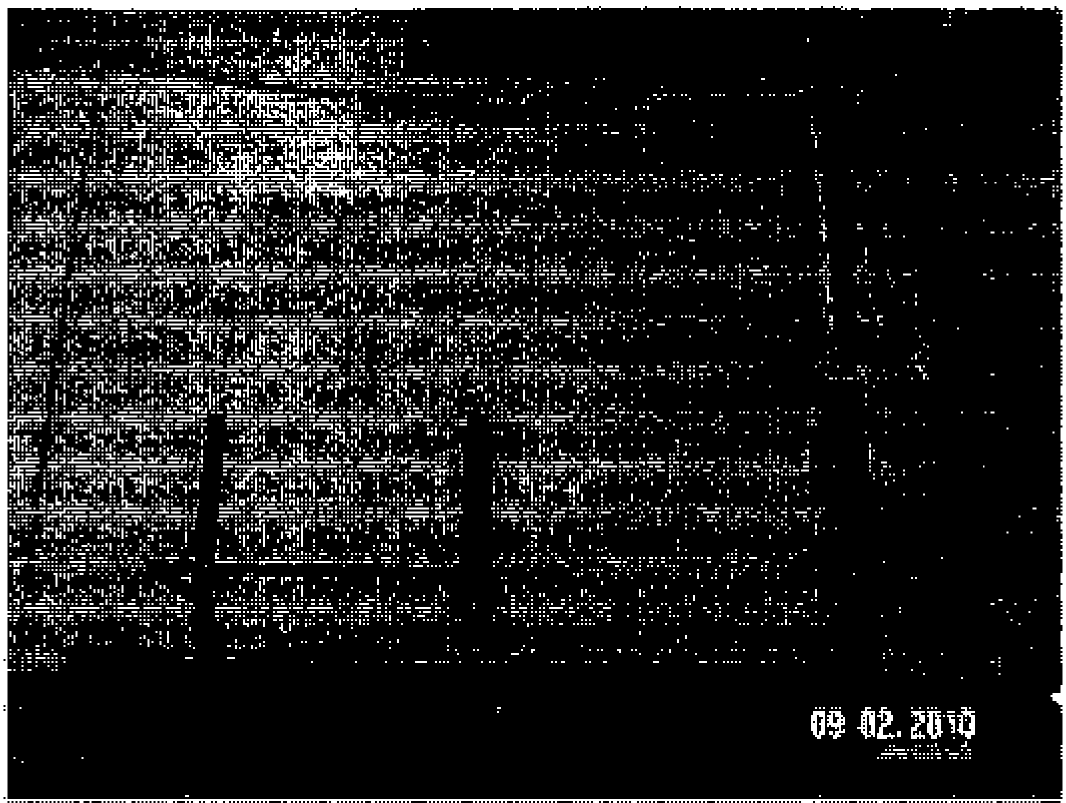

Photo 4: Drill Hall; water damage on lobby side wall

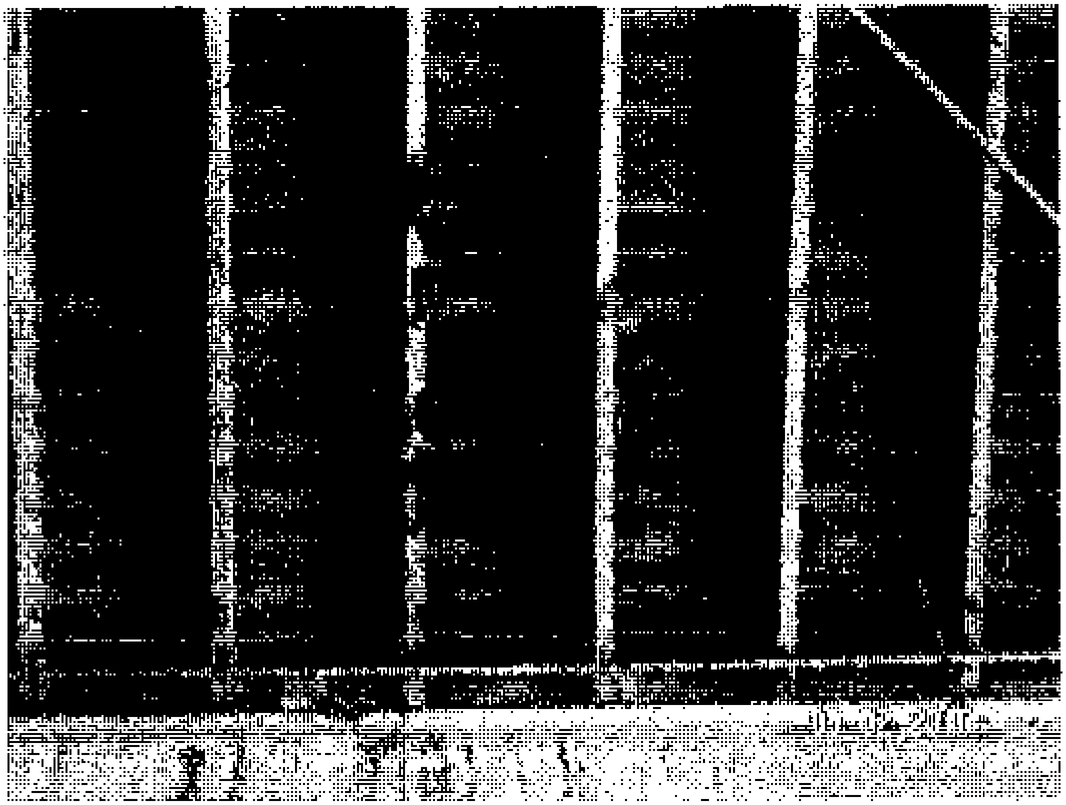

Photo 5: Storage area outside kitchen; damage to ceiling lumber

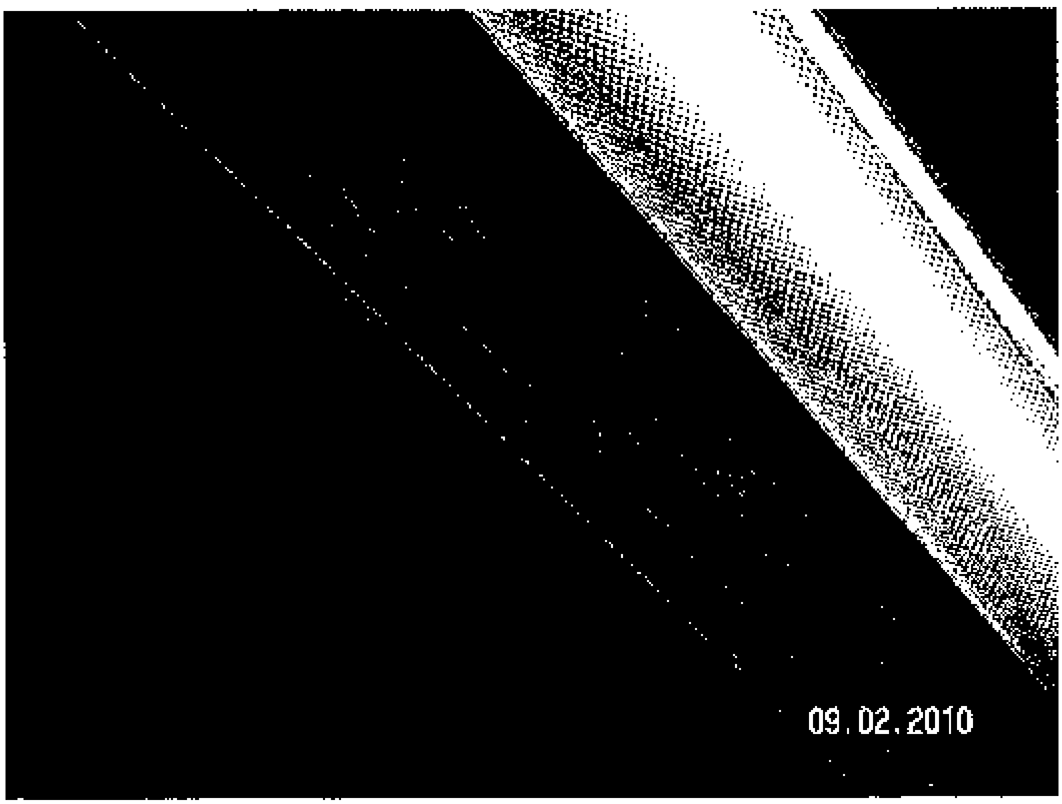

Photo 6: Kitchen; chipping / peeling paint on ceiling

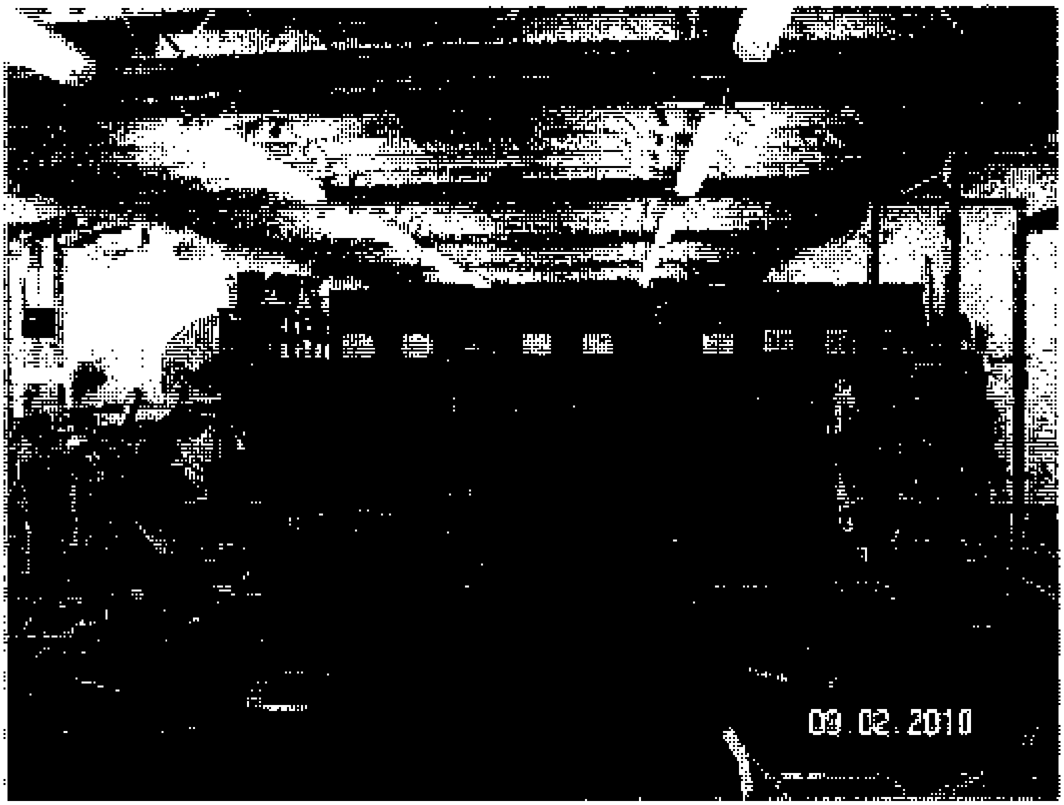

Photo 7: Converted firing range

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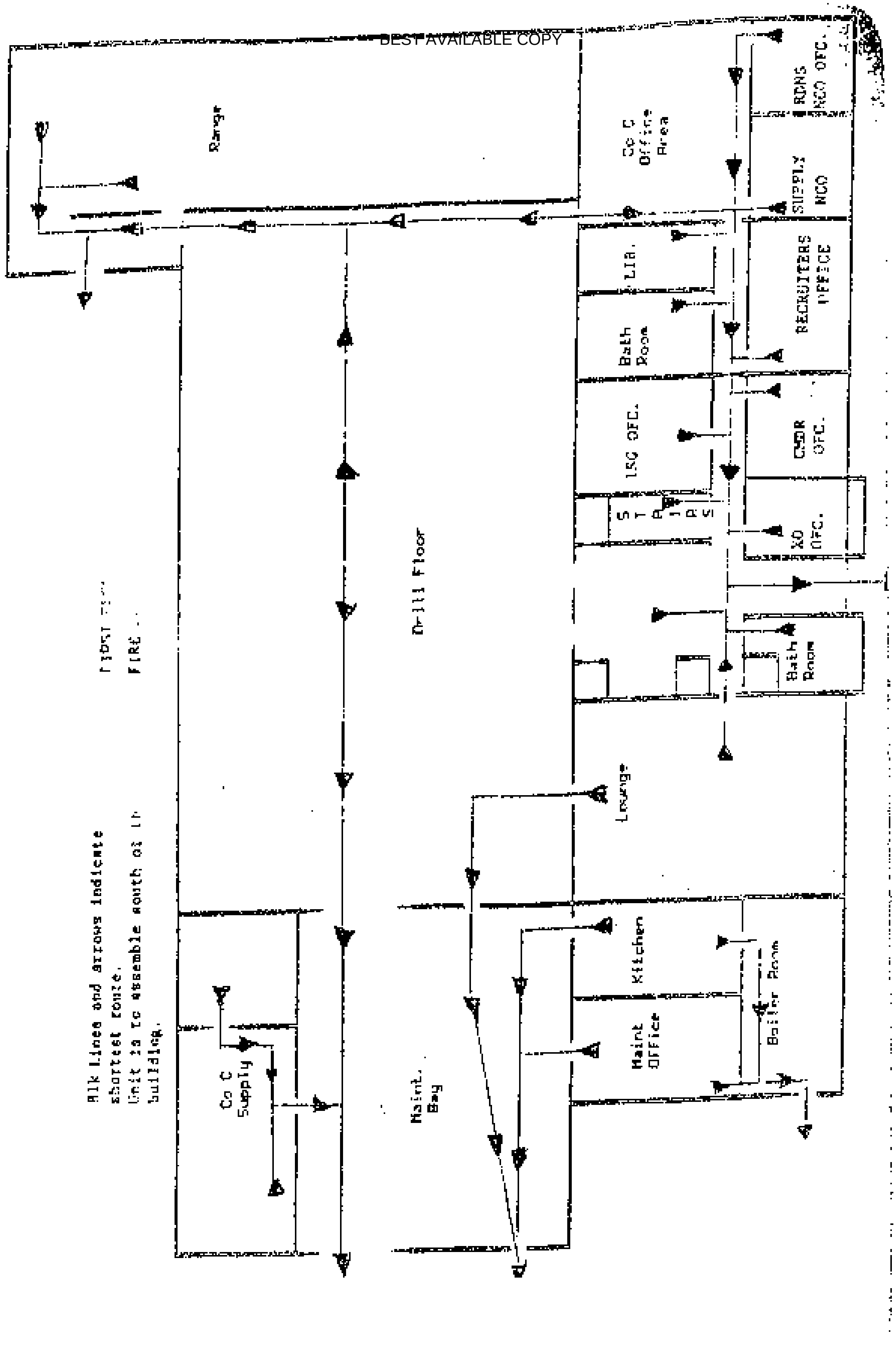
Appendix C
Floor Plan



Range
Co C Office Area
RDNS NCO OFC.
SUPPLY NCO
LIB.
RECRUITERS OFFICE
Bath Room
1SG OFC.
CMDR OFC.
S T A I R S
XO OFC.
Drill Floor
Bath Room
Lounge
Kitchen
Boiler Room
Maint Office
Maint. Bay
Co C Supply
FIRE ..
Blk Lines and arrows indicate shortest route.
Unit is to assemble south of the building.

Appendix D
References

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Appendix D. References

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

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

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

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

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

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

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

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

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

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

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COMPLIANCE MANAGEMENT INTERNATIONAL

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
Greenbelt Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Greenbelt Readiness Center** **7100 Greenbelt Road** **Greenbelt, MD 20770**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**May 9, 2013**
Report Date:	**June 17, 2013**

Non-Responsive

Non-Responsive
Manager, Industrial Hygiene Services

Table of Contents

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on May 9, 2013, at the Greenbelt Readiness Center located at 7100 Greenbelt Road, Greenbelt, MD 20770. The survey was performed by Mr. [redacted].

1. Lead surface, bulk, and air samples were collected. Surface levels of lead exceeded 200 micrograms per square foot (ug/ft^2) in one location. See Section 3.0 for detailed sampling results.

2. Lighting levels did not meet the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in one location. See Section 4.0 for detailed findings.

3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.

    a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in all areas sampled.

    b. The relative humidity levels were above the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in all occupied areas sampled.

    c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 ppm.

    d. Carbon dioxide ($CO_{2)}$ levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings.

    See Section 5.0 for detailed sampling results.

4. Several active roof leaks were present at the time of the survey. See Section 5.0 for detailed findings.

5. Water-stained ceiling tiles were observed in the facility. See Section 5.0 for detailed findings.

6. Several areas have asbestos containing material (ACM) floor tiles. See Section 6.0 for detailed findings.

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Section 2.0 Operation Description & Observations

The Greenbelt Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, and a converted firing range area (currently wall locker storage room). There was an addition to the building in 2009. There were approximately 2 full-time employees stationed at this facility at the time of this survey.

The building is reported to have been built in 1954. It is a two-story structure. The exterior is brick and block. The interior walls are brick, block, plaster, and paneling with drywall in some of the offices. The floors are concrete, stone tile, and 9"X9" floor tiles.

The heating system consists of a gas-fired steam generating unit. There is no central A/C system; some portable A/C units are present in the facility.

There is no child-care facility in the building.

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

This facility has a converted firing range that is now used to store wall lockers.

This facility has a few active roof leaks with standing water on the floor in some locations.

This facility has some areas of localized damaged 9"X9" asbestos floor tile, < 10% of the total floor tile.

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Section 3.0 Lead Testing

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

Lead Testing Results Summary

Sample #	Location	Bulk (%)	Air ug/m^3	Surface ug/ft^2
1	Drill Hall	*	<5.7	*
2	Converted Firing Range/Locker Storage	*	<5.7	*
3	Drill Hall - Floor	*	*	<110
4	Drill Hall – Top of Electrical Panel	*	*	<110
5	**Drill Hall – Top of Bulletin Board**	*	*	**490**
6	Kitchen – Top of Ice Machine	*	*	<110
7	Kitchen – Top of Microwave	*	*	<110
8	1ST Sgt. Office – Top of Book Shelf	*	*	<110
9	Recruiting Office – Top of Desk	*	*	<110
10	Hall to Converted Range - Floor	*	*	<110
11	Converted Range - Floor	*	*	<110
12	Converted Range – Top of Wall Locker	*	*	<110
13	2nd Floor Classroom #1 – Top of TV	*	*	<110
14	2nd Floor Office #3 – Top of Desk	*	*	<110
15	Lounge – Top of Book Shelf	*	*	<110
16	Kitchen – Ceiling Paint Chip	0.041	*	*
17	Boiler Room – Ceiling Paint Chip	<0.0068	*	*
19	Blank - Air	*	<3	*
20	Blank - Wipe	*	*	<12
-	**Criteria**	**0.5**	**50**	**200**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2 =** micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Sources:

1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges
2. OSHA 29CFR1910.1025 Lead Standard

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

Lead surface and air 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/ft^2 in the following location: Drill Hall.

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

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

- Two paint chip samples were collected. One sample was collected from the Kitchen ceiling (approximately 40 square feet of peeling paint) and the other sample was collected from the Boiler Room ceiling (approximately 800 square feet of peeling paint). These sample results indicate that the paint chips did not contain lead greater than the recommended guideline of 0.5 %.

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
Lounge	52.8	10	Yes
Copy Room	56.1	10	Yes
1ST Sgt. Office	70.1	30-50	Yes
Commanders Office	37.0	30-50	Yes
Recruiter’s Office	58.5	30-50	Yes
Company C Office Area	57.0	30-50	Yes
NCO Office	114.1	30-50	Yes
Drill Hall	64.7	10	Yes
Cage Storage Area	30.2	5	Yes
Kitchen	**37.1**	**50**	**No**
Classroom One	75.5	30-50	Yes
Office One	157.3	30-50	Yes
Classroom Two	42.1	30-50	Yes
Office Three	81.6	30-50	Yes

Table Notes:

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

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

The lighting level did not meet the minimum recommended guideline in the Kitchen. Lighting should be improved in these areas.

Section 5.0 Indoor Air Quality

Survey measurements were made for comfort parameters and ventilation (temperature, relative humidity, carbon dioxide, and carbon monoxide). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7575-X (Serial #1228008). The IAQ Meter was last calibrated in July 2012.

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

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
NCO Office	69.1	**62.9**	466	0.0
Copy Room	69.9	**63.6**	452	0.0
Lobby	69.4	**60.8**	416	0.0
Outdoors	71.1	55.8	377	0.0
Criteria	**68-79**	**30-60**	**<1,077**	**<9**

Table Notes:

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

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements met the recommended 68-79°F in all occupied areas.

- Relative humidity levels were above the recommended guidelines in all sampled areas. Relative humidity should be maintained at 30-60%.

- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,077 ppm (700 ppm + 377 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:

    - Active Roof leaks with standing water on the floor in the following locations;
        1. Converted maintenance bay
        2. Drill Hall
        3. Wall locker storage room
        4. Second floor office one
    - Water-stained ceiling tiles were observed in the facility.
    - Musty odor in the Commanders office from water damage.
    - Water damaged building components from roof leaks.

Section 6.0 Suspect Asbestos Containing Building Materials

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

1. The facility has 9”x9” floor tiles in most rooms. Two shades of green and black, as well as white and brown floor tiles.

2. The following areas have localized (<10%) of the total floor tile present, damaged floors tiles and should be repaired:
   - Recruiting office
   - Lounge
   - Second floor Office one
   - Commanders Office

A bulk sample was collected from the lounge of the 9”x9” black and green floor tile and black mastic. The floor tile result was positive for asbestos (3%). The mastic result indicated a trace (< 1%) of asbestos, possibly due to associate positive from floor tile.

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

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Section 7.0 Equipment

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

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98011EL	11/2012	NA
SKC Air Sampling Pump	647598	5/9/13	2.5 LPM
SKC Air Sampling Pump	767926	5/9/13	2.5 LPM

Section 8.0 Limitations

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

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

Appendix A. Laboratory Analysis Report

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AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	Maryland	**Chain Of Custody:**	515881
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Greenbelt RC	**Date Submitted:**	5/14/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	5/20/2013
				Report Date:	5/22/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
13062004	1	Flame	Air	525	N/A	5.7	ug/m³	<3	<5.7	ug/m³	
13062005	2	Flame	Air	525	N/A	5.7	ug/m³	<3	<5.7	ug/m³	
13062006	3	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13062007	4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13062008	5	Flame	Wipe	****	0.108	110	ug/ft²	53	490	ug/ft²	
13062009	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13062010	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13062011	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13062012	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13062013	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13062014	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13062015	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13062016	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13062017	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13062018	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13062019	16	Flame	Paint Chip	****	N/A	0.0059	%Pb		0.041	%Pb	
13062020	17	Flame	Paint Chip	****	N/A	0.0068	%Pb		<0.0068	%Pb	
13062023	19	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13062024	20	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	

An AIHA (#100470) and NY ELAP (#10920) Accredited Laboratory
4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

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

Client:	National Guard Bureau	**Job Name:**	Maryland	**Chain Of Custody:**	515881
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Greenbelt RC	**Date Submitted:**	5/14/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	Non-Responsive [redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	5/20/2013 **Report Date:** 5/22/2013

Attention: Non-Responsive [redacted]

Summary of Atomic Absorption Analysis for Lead

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

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

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

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

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

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

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

Air and Wipe results are not corrected for any blank results

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

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

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

Analyst: L. Butruk / S. Chinnapad

Technical Manager: G Edward Carney

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

Client:	National Guard Bureau	**Job Name:**	Maryland	**Chain Of Custody:**	515881
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Greenbelt RC	**Date Analyzed:**	5/21/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003		
Attention:	[redacted]				

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments
13062021	18 FT	3	3	--	--	--	--	--	--	--	--	97	FT	Black	Homogeneous	SW	
13062022	18 M	TR	TR	--	--	--	--	--	--	--	--	100	MS	Black	Homogeneous	SW	Chrysotile present is possible contamination associate positive from FT.

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP®
101143-0

Client:	National Guard Bureau	**Job Name:**	Maryland	**Chain Of Custody:**	515881
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Greenbelt RC	**Date Analyzed:**	5/21/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	Non-Responsive [redacted]
		P.O. Number:	W912K6-09-A-0003		

Attention: Non-Responsive [redacted]

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments

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

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

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

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

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

Technical Director Peerawut Chaikeenee

Analyst(s) Surat Watson

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) 515881

(page 1 of 2)

Mailing/Billing Information:

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

Submittal Information:

1. Job Name: Maryland
2. Job Location: Greenbelt RC
3. Job #: [redacted] Non-Responsive PO #: W912K6-09-A-0003
4. Contact Perso[redacted] @ phone #: (410) 942-0273
5. Submitted by: [redacted] Signature: [redacted] Non-Responsive

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

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ____ ☐ 24 Hours Time Due: ____ Comments: ____	MEM ~~☒ Immediate~~ ☐ 3 Day ☐ Next Day ☒ 5 Day + ☐ 2 Day Date Due: 5/21/13 ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ Inclu[redacted] Non-Responsive with Report ☒ Emai[redacted] Compliance place. Room ☐ Fax: [redacted] us.army.mil ☐ Verba[redacted] us.army.mil

Asbestos Analysis

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

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

PLM Bulk
- ☒ EPA 600 – Visual Estimate 1 (QTY)
- ☐ EPA Point Count____(QTY)
- ☐ NY State Friable 198.1____(QTY)
- ☐ Grav. Reduction ELAP 198.6____(QTY)
- ☐ Other (specify____)____(QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
- ☐ ELAP 198.4/Chatfield____(QTY)
- ☐ NY State PLM/TEM____(QTY)
- ☐ Residual Ash____(QTY)

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

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

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

Metals Analysis
- ☒ Pb Paint Chip 2 (QTY)
- ☒ Pb Dust Wipe (wipe type Ghost) 14 (QTY)
- ☒ Pb Air 3 (QTY)
- ☐ Pb Soil/Solid____(QTY)
- ☐ Pb TCLP____(QTY)
- ☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Pb Furnace (Media____)____(QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples:____
Collection Media____
- ☐ Spore-Trap____(QTY) ☐ Surface Vacuum Dust____(QTY)
- ☐ Surface Swab____(QTY) ☐ Culturable ID Genus (Media____)____(QTY)
- ☐ Surface Tape____(QTY) ☐ Culturable ID Species (Media____)____(QTY)
- ☐ Other (Specify____)____(QTY)

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1	Drill Hall	5-9	525					X								
1 2	Converted Range		525					X								
2 3	Drill Hall floor			100 cm2				X								
3 4	Drill Hall Ele. Box							X								
4 5	Drill Hall Bulletin Board							X								
5 6	Kitchen Ice machine							X								
6 7	Kitchen - microwave							X								
7 8	1st. Sgt off. Book shelf							X								
8 9	Recruiting office Desk							X								
9 10	Converted Range floor - Hall							X								
10 11	Converted Range floor							X								
11 12	Converted Range locker							X								

CLIENT CONTACT
(LABORATORY STAFF ONLY)

Date/Time: Contact: By:
TAT Changed to comply with contract w/ NATLG

Date/Time: Contact: By:

Date/Time: Contact: By:

LABORATORY STAFF ONLY (CUSTODY)

1. Date/Time RCVD: 5/14/13 @ 1030 Via: FedEx By (Print): MEM Sign:
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ___/___/___ Time: ____ Initials: ____
4. Comments: 7945 0135 1790

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) 515881 (page 2 of 2)

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

Submittal Information:
1. Job Name: Maryland
2. Job Location: Greenbelt RC
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person [redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted] Signature: [redacted]

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

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ 3 Day ☐ Next Day ☐ 5 Day + ☐ 2 Day Date Due: ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ Includ[redacted] with Report ☒ Email: [redacted] @ compliance.plans.cn ☐ Fax: [redacted] @us.army.mil ☐ Verbal [redacted] @us.army.mil

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

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

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

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

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

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13	Classroom 1 TV	5-9		100 cm²				X								
14	Office 3 Desk	↓		↓				X								
15	Lounge Bookshelf							X								
16	Kitchen - Ceiling							X			X					
17	Boiler Room Ceil							X			X					
18	Lounge 9x9 Floor tile & mastic						X									
19	Blank - Air		0													
20	Blank Wipe	↓		0												

CLIENT CONTACT (LABORATORY STAFF ONLY)

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

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

Appendix B. Photographs

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Exterior of the facility

Drill Hall

Converted firing range/locker room

Peeling paint on the ceiling in the kitchen

Effloresces on the exterior walls of the converted maintenance bay

Standing water on the 9”X9” brown and white floor tile from an active roof leak.

Green and black 9”X9” floor tile

Recruiter’s office 9”X9” damaged floor tile one of several locations

Water stained ceiling tile

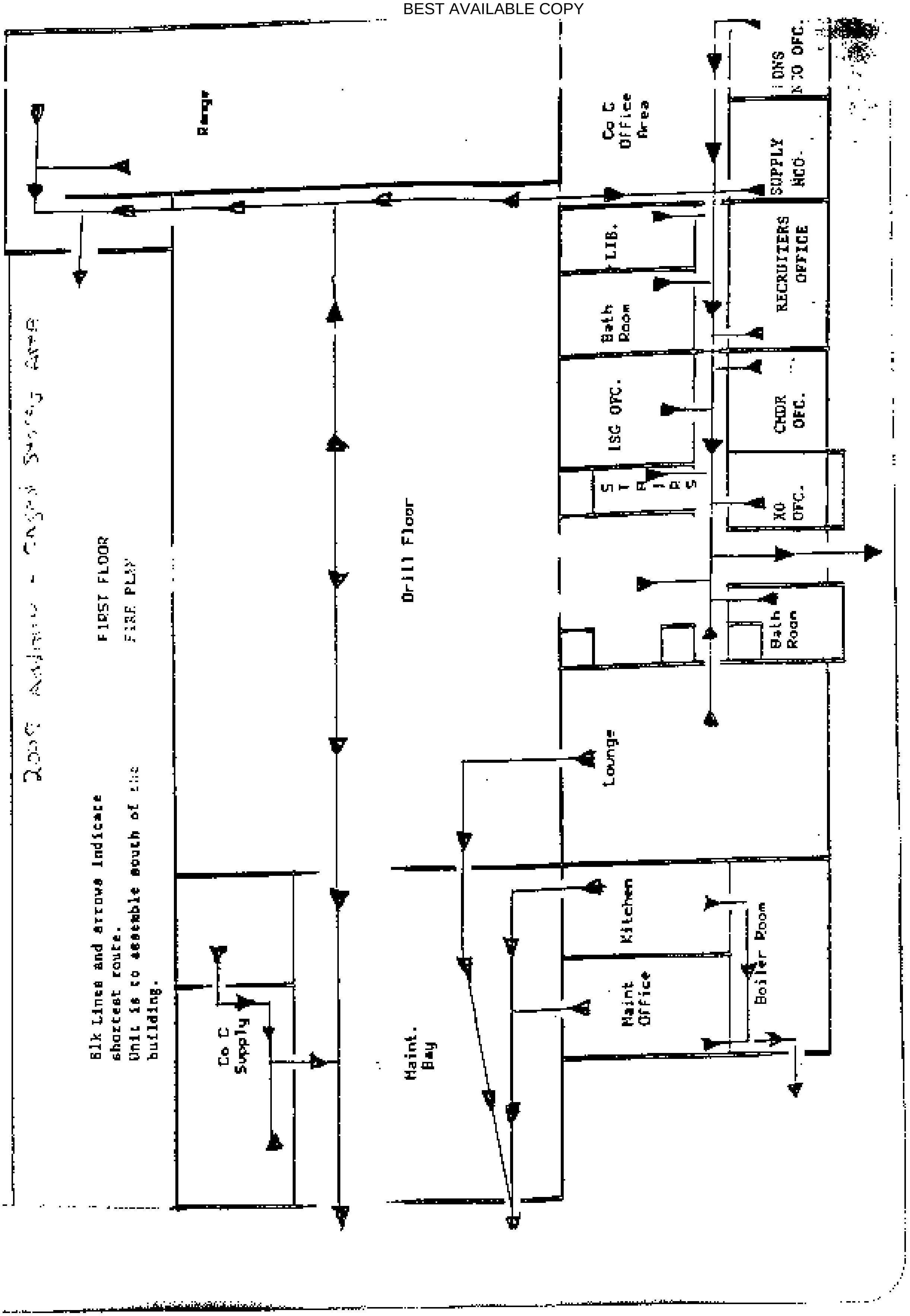
Green 9"X9" floor tile

Peeling paint on ceiling and walls in the boiler room

9”X9” black floor tile

Water damaged paneling from roof leak in the supply NCO office

Appendix C. Floor Plan


Range
Co C Office Area
NCO OFC.
SUPPLY NCO
LIB.
RECRUITERS OFFICE
Bath Room
ISG OFC.
CMDR OFC.
STAIRS
XO OFC.
Bath Room
Drill Floor
FIRST FLOOR
FIRE PLAN
Lounge
Kitchen
Boiler Room
Maint Office
Maint. Bay
Co C Supply
Blk Lines and arrows indicate shortest route.
Unit is to assemble south of the building.

COMPLIANCE MANAGEMENT INTERNATIONAL

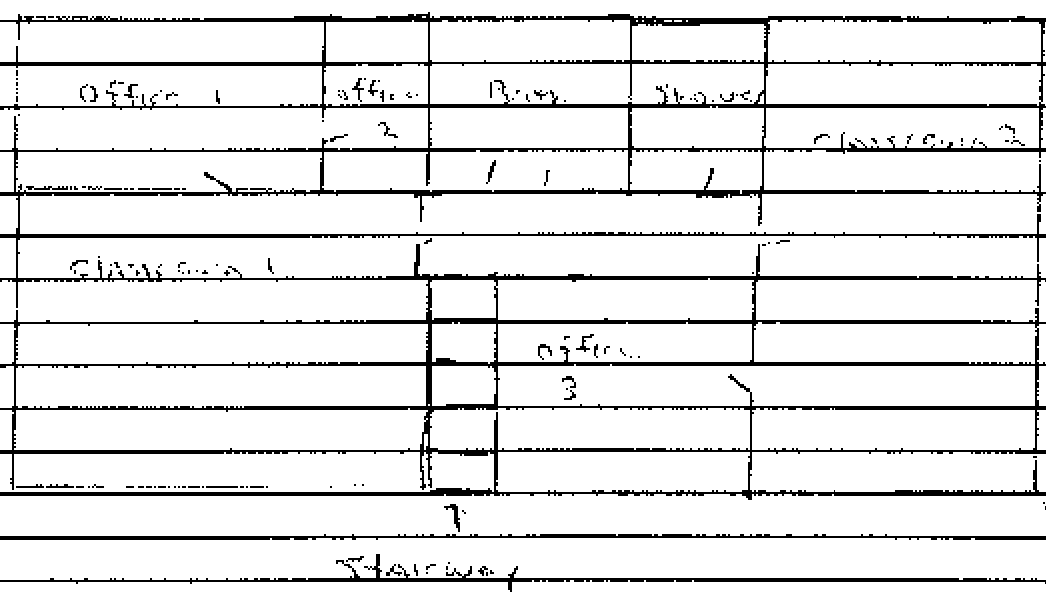
1215 Manor Drive, Suite 205
Mechanicsburg, PA 17055
Phone: 215.699.4800
Fax: 215.699.8315

Daily Notes

Date: 5-9-15

Project Name: ARNG-MD Greenbelt

2nd fl



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.

ANALYTICAL LABORATORY SERVICES, INC.
Environmental ✦ Industrial Hygiene ✦ Field Services
www.analyticallab.com

Industrial Hygiene Survey

National Guard Facility
Gunpowder (Purnell) Armory
10901 Notchcliff Road
Glen Arm, MD 21057-9998

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Gunpowder (Purnell) Armory** **10901 Notchcliff Road** **Glen Arm, MD 21057**
Prepared By:	**Analytical Laboratory Services, Inc.** **3544 North Progress Avenue** **Suite 100** **Harrisburg, PA 17110**
Survey Date:	**July 23, 2010**
Report Date:	**August 23, 2010**
ALSI Project #:	**1007467**

Non-Responsive [redacted]

Director, Environmental Health & Safety

Table of Contents

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Section 1.0
Executive Summary

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Section 1.0 Executive Summary

On July 23, 2010, Analytical Laboratory Services, Inc. (ALSI) personnel Ms. [redacted] performed an industrial hygiene survey at the Gunpowder Armory located at 10901 Notchcliff Road, Glen Arm, MD 21057-9998. This is also referred to as the William C. Purnell Armory.

1. Surface levels of lead exceeded 200 ug/ft^2 in Room 126 on the supply vent. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2.

2. Lighting within the facility was evaluated. Lighting levels met the minimum recommended guidelines in all but three areas: 1) Kitchen, 2) Drill Hall. Lighting should be improved in these areas.

3. Indoor air quality parameters of temperature, relative humidity carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment. Relative humidity exceeded the recommended ceiling of 60% and temperature exceeded the recommended criteria of 79 degrees F in some indoor locations. There is a central air conditioning system in this building. The air-conditioning system should be inspected to determine if it is operating correctly and as designed. Relative humidity should be maintained at 30-60% whenever possible.

4. Some water damaged ceilings or other areas were observed. All sources of water infiltration should be identified and repaired. Water damaged ceiling and building materials should be removed and replaced.

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Section 2.0
Operation Description & Observations

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Section 2.0 Operation Description & Observations

The Gunpowder (Purnell) Armory serves primarily as an office setting and equipment storage facility. The facility consists of offices, a drill hall, and storage areas. There is no garage area.

The building was initially constructed in 1974. The exterior of the building is brick. The interior walls are primarily concrete block with finished drywall in some areas. The floors were composed of a poured concrete slab. The ceilings were generally composed of a roof deck with a suspended drop ceiling system in some areas.

There is a central heating, ventilating, and air conditioning system (HVAC) present. It is approximately 10 years old. At the time of this survey it was in operation but facility staff stated that it was not working properly and is often in need of maintenance. ALSI personnel inspected accessible areas of the HVAC system. No one at the facility could open the unit for our on site personnel to inspect the interior portion of the unit. The area around the roof-top unit appeared clean and well kept. Drain lines appeared to be working properly. There was no indication that reentrainment of exhaust or other contaminants was occurring. Supply and return vents were dusty and dirty in some areas.

There is an old firing range in the building. It has been fully abated. It is now used for storage and a locker room.

Overall housekeeping was fair. Floors were dirty in some areas.

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

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Section 3.0 Noise Survey

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

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Section 4.0
Lead Testing

Section 4.0 Lead Testing

At the time of the assessment, no activities were observed which would generate lead exposure. At one time the facility contained an indoor firing range. It is now a storage and locker room 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
1	Orderly Room 127	<4		
2	Drill Hall	<4		
3	Blank	<3 ug		
4	Room 126 – AC Supply Vent		**150**	
5	Drill Hall – Return Vent		<110	
6	Drill Hall – Floor		<110	
7	Drill Hall – Top of Soda Machine		<110	
8	Kitchen – Countertop		<110	
9	Room 127B – Top of Bookshelf		<110	
10	Converted Firing Range – Floor		<110	
11	Converted Firing Range – Top of Locker		<110	
12	Converted Firing Range - Bookshelf		<110	
13	Floor Outside Converted Firing Range		<110	
14	Room 105 – Desktop		<110	
15	Room 120 – Top of Locker		<110	
16	Room 117A – Supply Vent		<110	
17	Blank		<12	
Criteria		**50**	**200**	**0.5**

Key: **Bolded** results exceed listed criteria

Surface levels of lead exceeded 200 ug/ft² in Room 126 on the AC Supply Vent.

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/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

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

Housekeeping and cleaning activities should be improved to maintain surface lead dust concentrations below 200 ug/ft^2.

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Section 5.0
Lighting

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Section 5.0 Lighting

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

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Room 125	26.0	30-50	No
Room 127	54.6	30-50	Yes
Room 104	36.8	30-50	Yes
Room 116	83.3	30-50	Yes
Room 117	131.8	30-50	Yes
Room 114 - **Kitchen**	**20.7**	50	No
Room 101 – Drill Hall	**24.4**	30-50	No
Room 112	40.8	30-50	Yes
Room 105	49.2	30-50	Yes
Room 110	53.0	30-50	Yes
Room 120	40.2	30-50	Yes

Lighting levels met the minimum recommended guidelines in all but three areas: 1) Kitchen, 2) Drill Hall. Lighting should be improved in these areas.

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Section 6.0
Indoor Air Quality

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Section 6.0 Indoor Air Quality

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

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

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 69.5 to 80.1 degrees F with relative humidity readings ranging from 48.5% to 60.8%. During the survey, carbon dioxide (CO_2) levels ranged from 442 ppm to 494 ppm within the facility compared to an outdoor CO_2 level of 410 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,110 ppm (410 ppm + 700 ppm). The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Room 125	70.5	55.8	460	0.0
Room 127	69.6	**60.8**	463	0.0
Room 104	69.5	57.9	452	0.0
Room 116	72.4	57.4	456	0.0
Room 117	71.2	**60.8**	443	0.0
Room 114 Kitchen	73.8	57.3	442	0.0
Room 101 – Drill Hall	76.1	54.9	470	0.0
Room 112	78.3	51.9	451	0.0
Room 105	73.8	54.8	474	0.1
Room 110	77.9	54.5	494	0.0
Room 120	**80.1**	48.5	469	0.0
Outdoors	90.4	63.5	410	0.0
Criteria	**73.0-79.0**	**30-60**	**<1,110**	**<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 a few locations. There is a central air conditioning system in this building however, there are reported to be ongoing problems

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with the operation of the system including the day of this survey. 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. The current HVAC system does not function well. It is often out of operation for maintenance.

2. There are ongoing roof leaks in the building. Some ceiling areas have water damage. Some ceiling tile have been removed and not replaced.

3. No areas of extensive microbial growth were observed. However, suspected microbial growth was present on some supply or return diffusers.

All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced. The HVAC system should be inspected to determine if it is operating correctly and as designed.

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Section 7.0
Suspect Asbestos Containing Building Materials

Section 7.0 Suspect Asbestos Containing Building Materials

No suspect asbestos containing materials (ACM) were identified. Hidden or inaccessible areas were not inspected. No samples were collected.

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Section 8.0
Maintenance Bay

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Section 8.0 Maintenance Bay

There is no garage or maintenance area at this facility.

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Section 9.0
Limitations

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Section 9.0 Limitations

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

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

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Appendix A
Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP 10920

Client:	National Guard Bureau	Job Name:	Gunpowder (Purnell) Armory	Chain Of Custody:	508385
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Glen Arm, MD	Date Submitted:	7/26/2010
	Havre de Grace, Maryland 21078	Job Number:	Gunpowder (Purnell) Armory	Person Submitting:	[redacted]
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	7/30/2010 Report Date: 7/30/2010

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
1064283	1007467-1	Flame	Air	752	N/A	4	ug/m^3	<3	<4	ug/m^3	
1064284	1007467-2	Flame	Air	749	N/A	4	ug/m^3	<3	<4	ug/m^3	
1064285	1007467-3	Flame	Air Blank	0	N/A	3	ug/m^3		<3	ug	
1064286	1007467-4	Flame	Wipe	****	0.108	110	ug/ft^2	16	150	ug/ft^2	
1064287	1007467-5	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1064288	1007467-6	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1064289	1007467-7	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1064290	1007467-8	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1064291	1007467-9	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1064292	1007467-10	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1064293	1007467-11	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1064294	1007467-12	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1064295	1007467-13	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1064296	1007467-14	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1064297	1007467-15	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1064298	1007467-16	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1064299	1007467-17	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Gunpowder (Purnell) Armory	**Chain Of Custody:**	508385
Address:	301-JH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Glen Arm, MD	**Date Submitted:**	7/26/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Gunpowder (Purnell) Armory	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	7/30/2010 **Report Date:** 7/30/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

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

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

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information not verified by this laboratory.

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

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

Nida Mc.

Analyst: Nida McGarvey

Technical Manager: G Edward Carney

An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory
4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

Page 1 of 2

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquiries) **508385**

PV2

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

Submittal Information:
1. Job Name: Gunpowder (Purnell) Armory
2. Job Location: Glen Arm, MD
3. Job #: Gunpowder (Purnell) Armory P.O. #: W912K6-09-A-0003
4. Contact Pers[redacted] @ phone #: (410) 942-0273
5. Submitted by[redacted]

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

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS		REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ Next Day ☐ 2 Day	☐ 3 Day ☒ 5 Day + Date Due: 8/2/10 ☐ Results Required By Noon (Every Attempt Will Be Made to Accommodate)	☒ Includ[redacted] @analyticallab.com ☒ Email [redacted]1@us.army.mil ☐ Fax: [redacted]e@us.army.mil ☐ Verbal

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

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

☒ All samples received in good condition unless otherwise noted.
☐ PM Water samples ______°C)

Metals Analysis
☐ Pb Paint Chip ______(QTY)
☒ Pb Dust Wipe (wipe type: ghost) 14 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ______(QTY)
☐ Pb TCLP ______(QTY)
☐ Drinking Water ☐ Pb ____(QTY) ☐ Cu ____(QTY) ☐ As ____(QTY)
☐ Waste Water ☐ Pb ____(QTY) ☐ Cu ____(QTY) ☐ As ____(QTY)
☐ Pb Furnace (Media ______) ______(QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media: ______
☐ Spore-Trap ______(QTY) ☐ Surface Vacuum Dust ______(QTY)
☐ Surface Swab ______(QTY) ☐ Culturable ID Genus (Media ______) ______(QTY)
☐ Surface Tape ______(QTY) ☐ Culturable ID Species (Media ______) ______(QTY)
☐ Other (Specify ______) ______(QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SHOW/ROAM	TAPE	SWAB
10074167-1	Orderly Rm 127	7/23	752.4					X		X						
10074167-2	Drill Hall		748.8					X		X						
10074167-3	Blank		0					X		X						
10074167-4	Rm 126 Supply		~~100cm~~	100cm²				X				X				
10074167-5	Drill Hall Return							X				X				
10074167-6	Drill Hall Floor							X				X				
10074167-7	Drill Hall [illegible]							X				X				
10074167-8	Kitchen Counter Top							X				X				
10074167-9	Rm 127B Bookshelf							X				X				
10074167-10	Firing Range Floor							X				X				
10074167-11	Firing Range Locker							X				X				
10074167-12	Firing Range Bookshelf							X				X				

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

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 7/26/10 @ 1145 Via: DD By (Print): Dave Hedson Sign:
2. Date/Time Analyzed: __/__/__ @ ____ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: __/__/__ Time: ______ Initials: ______
4. Comments: ______

Page 2 of 2

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 506385 P2/2

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

Submittal Information:
1. Job Name: Gunpowder (Purnell) Armory
2. Job Location: Glen Arm, MD
3. Job #: Gunpowder (Purnell) Armory P.O. #: W912K6-08-A-0003
4. Contact Pers[redacted] @ phone # (410) 942-0273
5. Submitted by [redacted] ignatu[redacted]

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

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☐ 5 Day+ Date Due: ☐ Results Required By Noon (Every Attempt Will Be Made to Accommodate)	☒ Include [redacted] with Report ☒ Email: [redacted] @amalytical.com ☐ Fax: [redacted] @us.army.mil ☐ Verbal [redacted] @us.army.mil

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

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

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

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 14 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Filmace (Media ____) ____ (QTY)

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

CLIENT ID NUMBER	SAMPLE INFORMATION SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1007467-13	Floor Adjacent Firing Range	7/23		100cm²				X				X				
1007467-14	Rm105 Desktop	↓		↓				X				X				
1007467-15	Rm100 Locker							X				X				
1007467-16	Rm117A Supply							X				X				
1007467-17	Blank			0cm²				X				X				

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

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

Appendix B
Photographs

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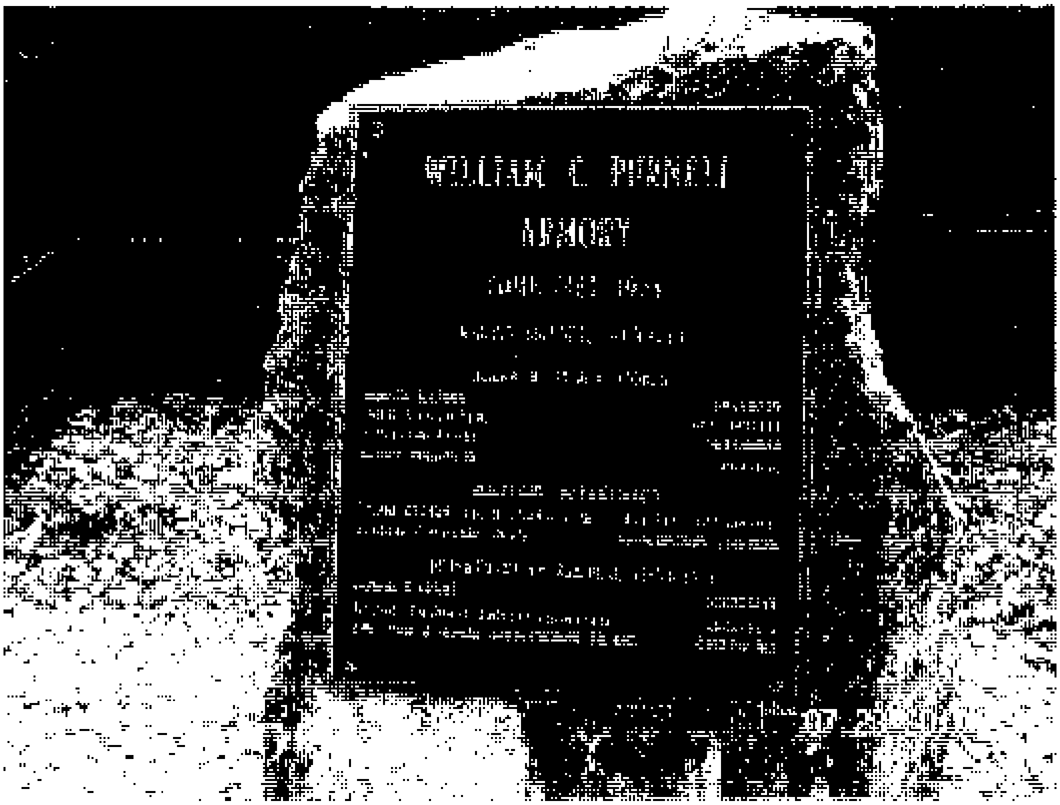
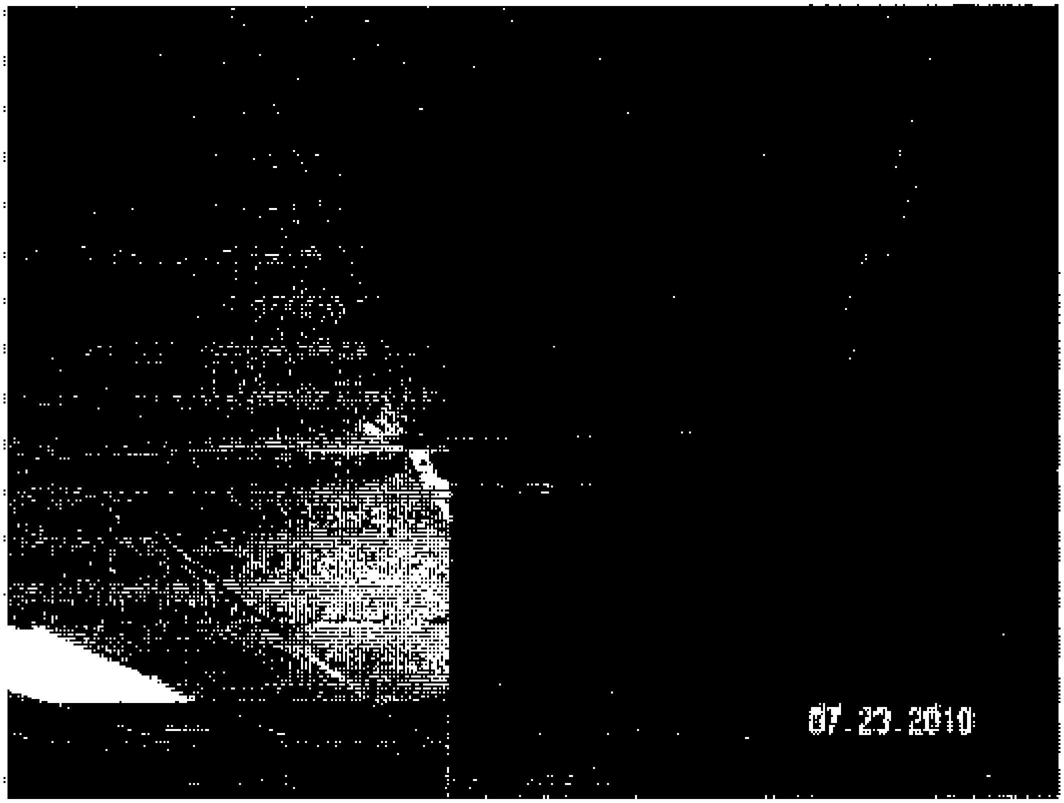
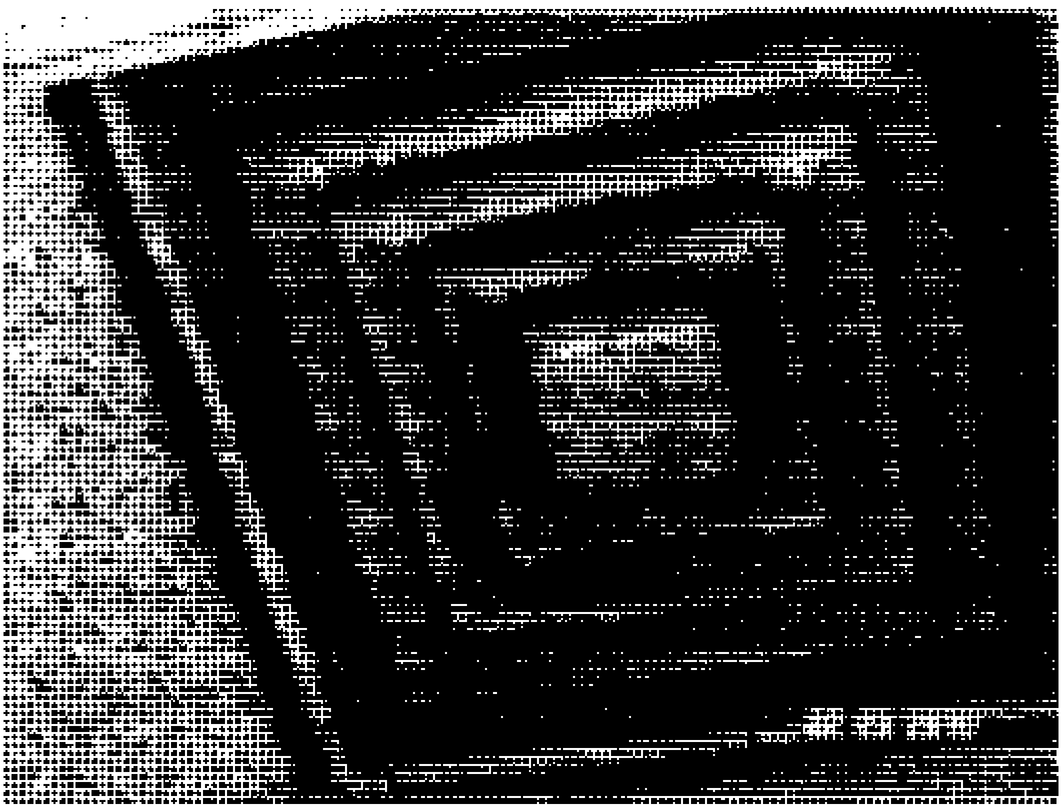


Stone plaque


Front of building, exterior



Stained ceiling tiles, uniform throughout building



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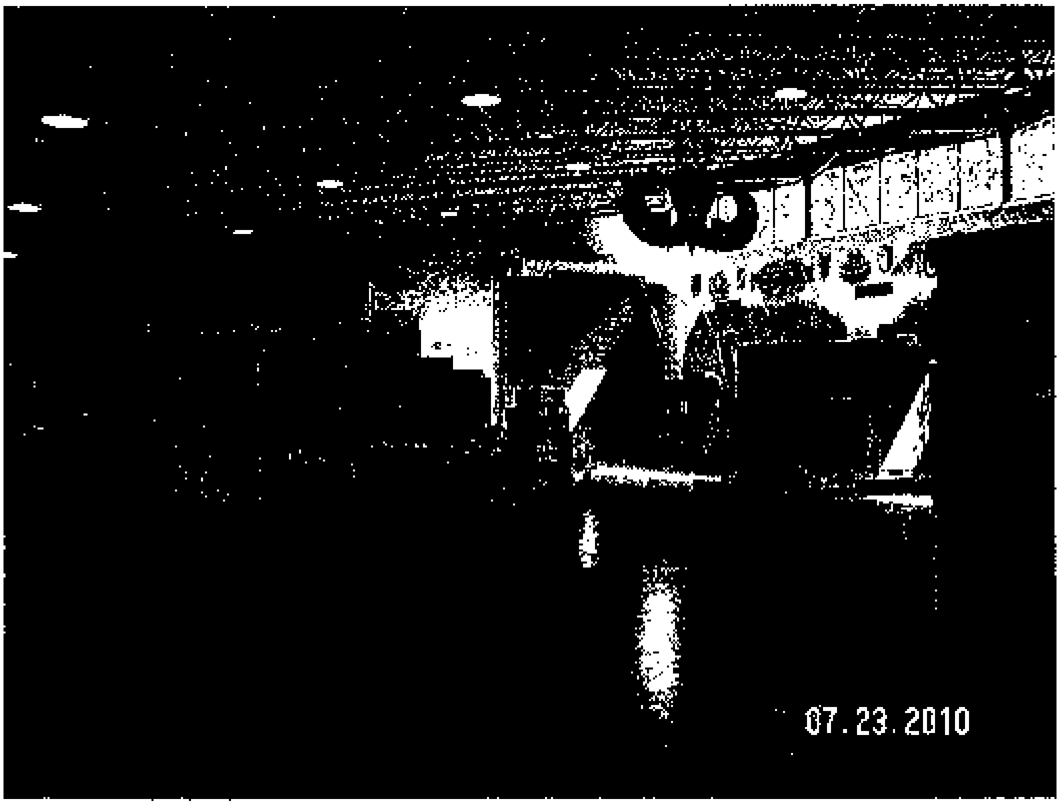
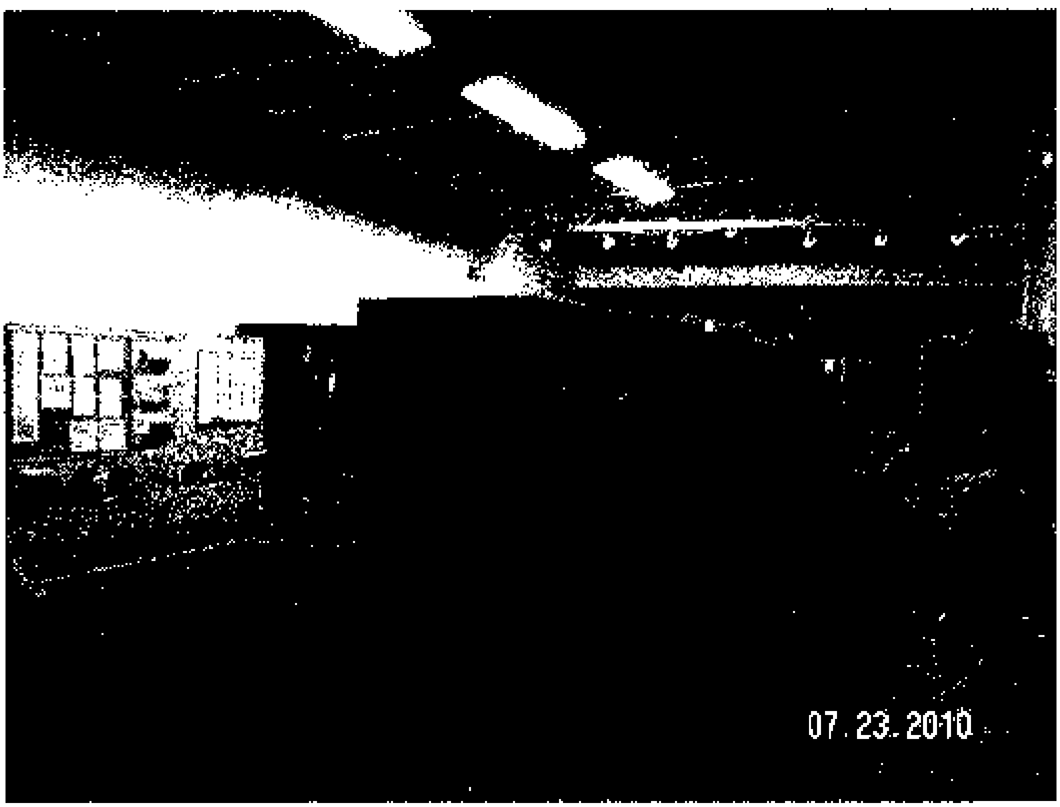
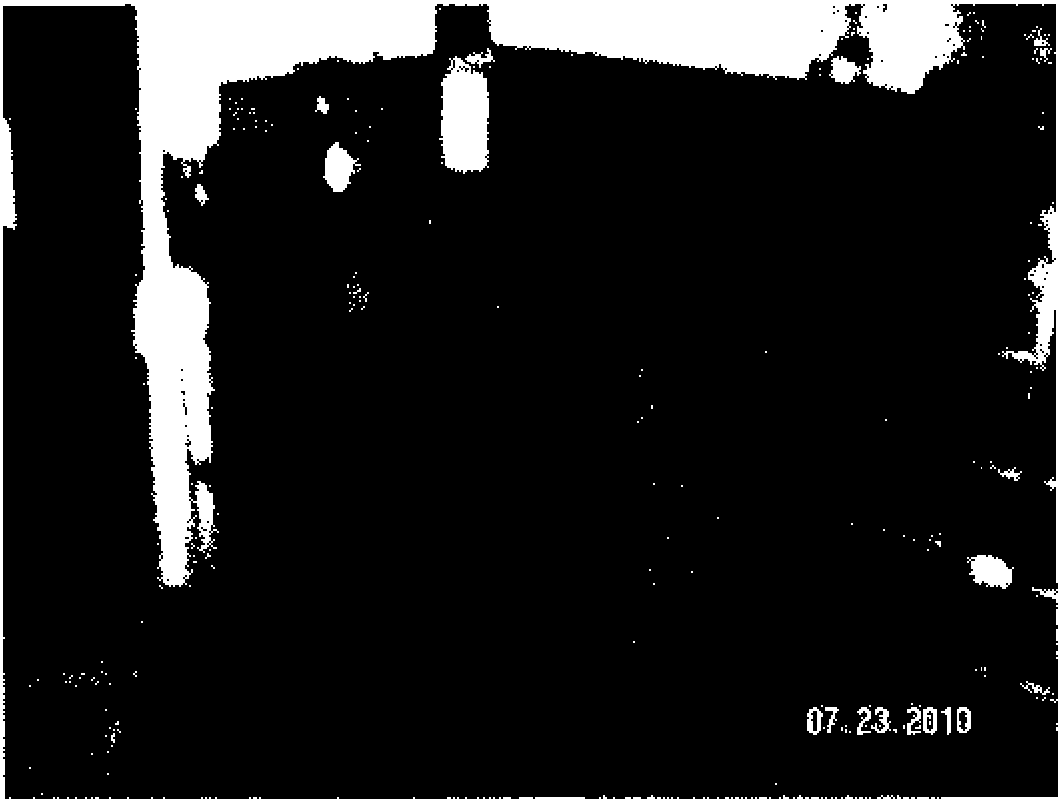


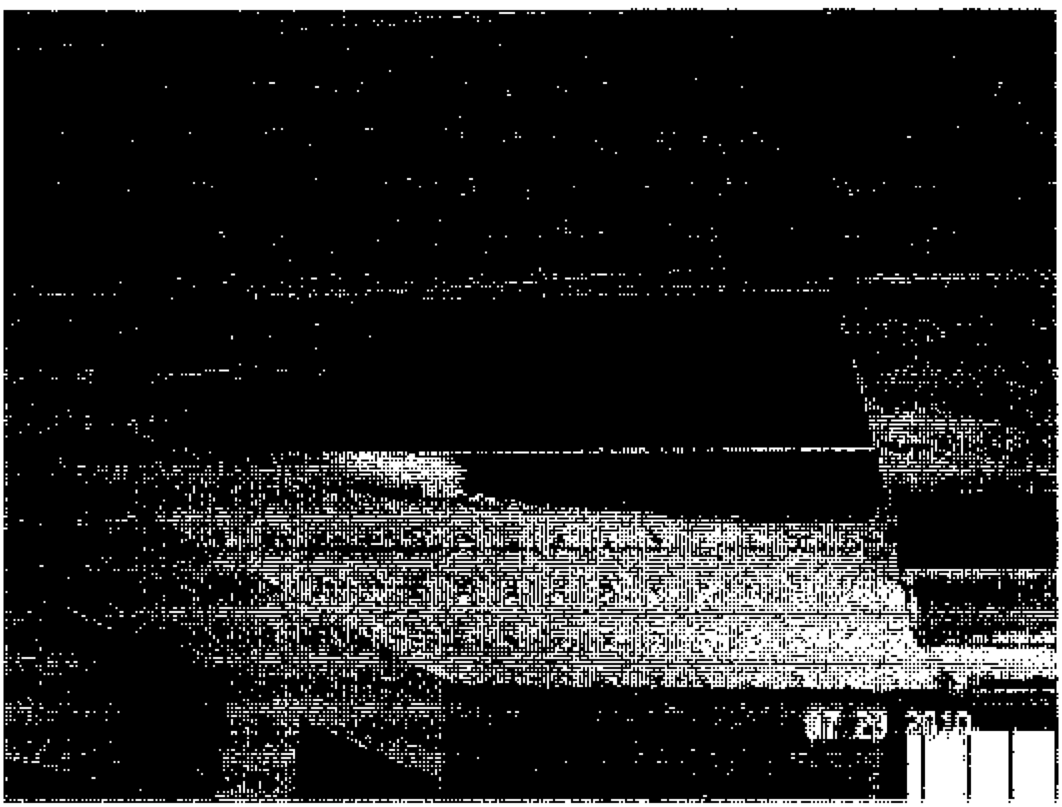
Drill Hall



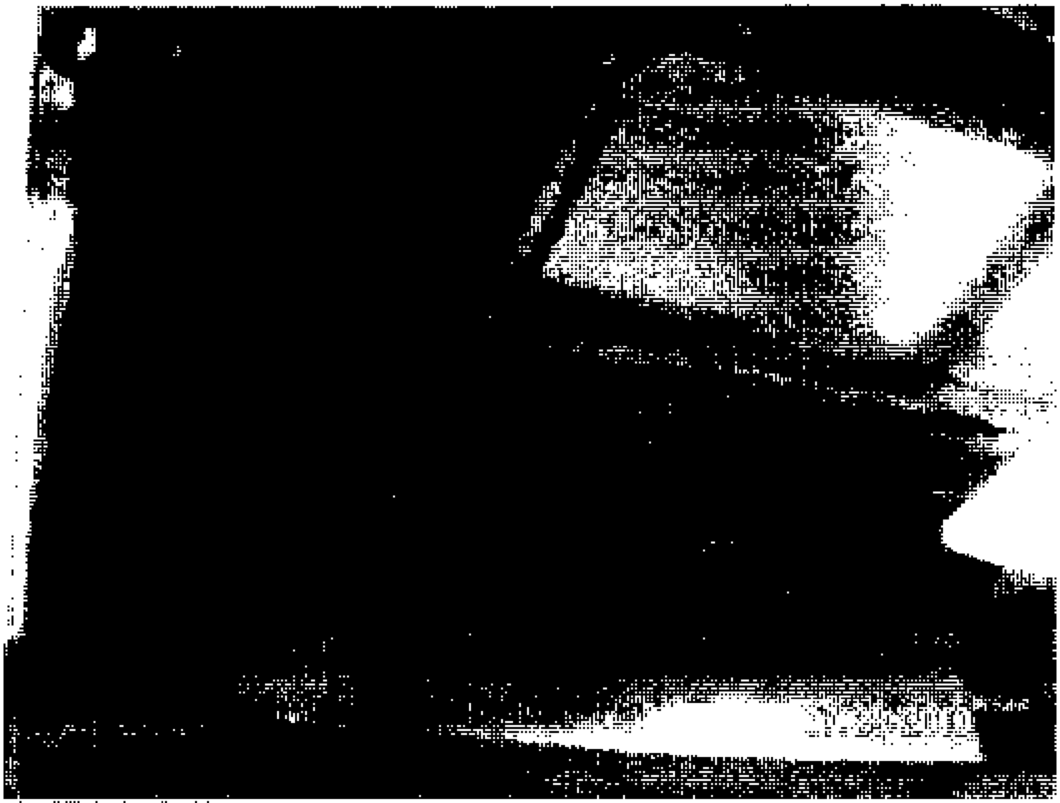
Converted firing range



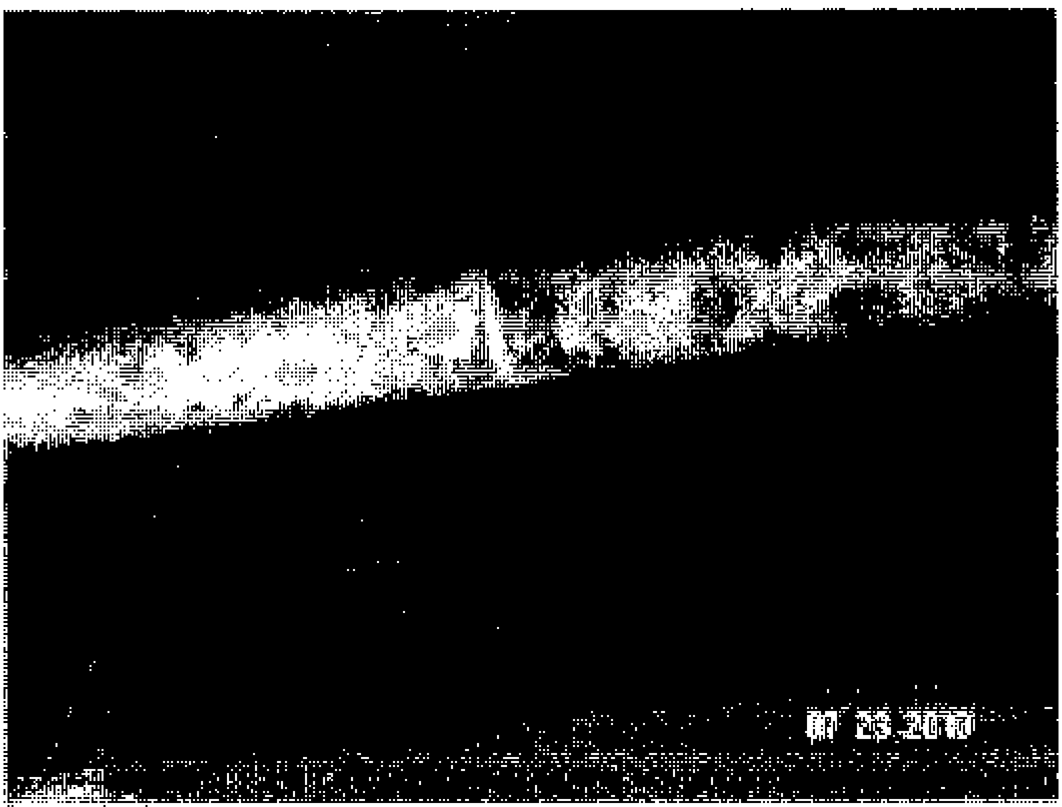
Boiler



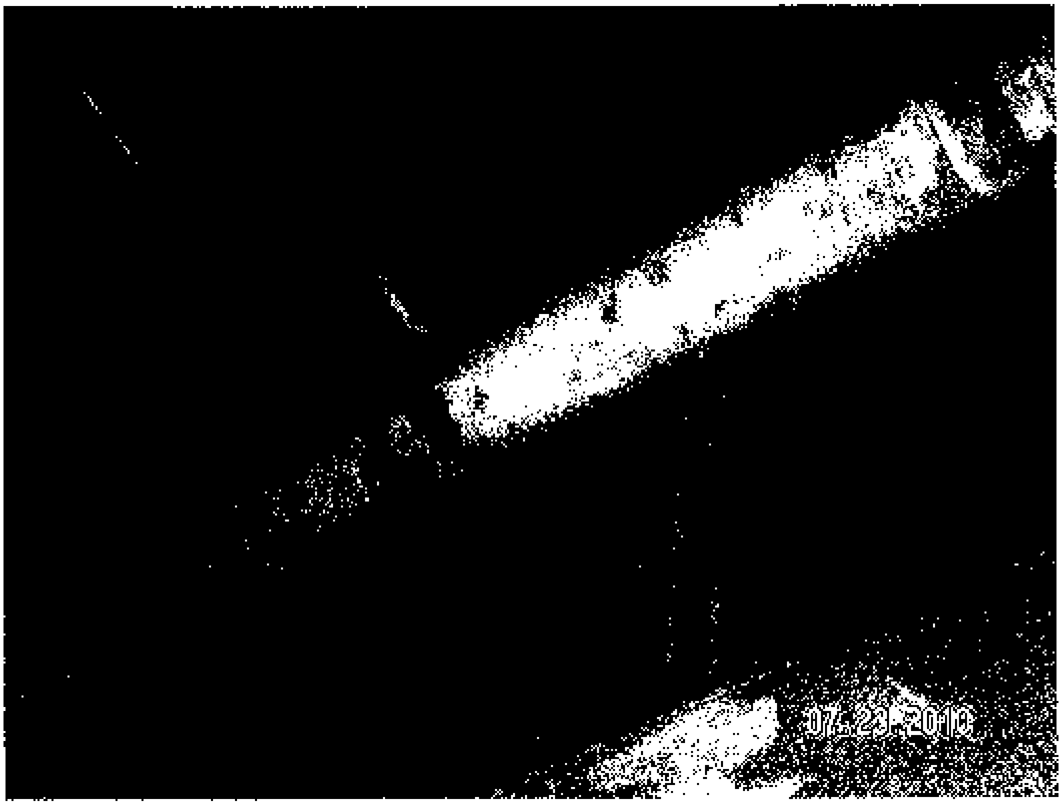
Broken / missing / stained ceiling tile (Room 117A), similar throughout



Heating Unit



Water staining on fiberglass pipe insulation above drop ceiling



Water staining on fiberglass pipe insulation above drop ceiling

Water staining of roof deck above drop ceiling

Appendix C
Floor Plans

Appendix C. Floor Plan

Floor Plan not available.

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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 (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2010 Edition

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

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

5. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Thermal Environmental Conditions for Human Occupancy, 55-2004

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

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

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

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

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

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

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

REPLY TO
ATTENTION OF

MCHB-TS-OFS May 2004

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

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03 Brig. Gen (MD) Randolph Millholland Armory, Hagerstown, MD

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

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

ENCL

[redacted]
Industrial Hygienist
Industrial Hygiene Field Services Program

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

USACHPPM

MDARNG FACILITIES IH BASELINE SURVEY
BG RANDOLPH MILLHOLLAND ARMORY
HAGERSTOWN, MD
55-ML-01ED-03

Approved for public release; distribution unlimited.

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

Readiness Thru Health

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

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

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

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

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

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

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

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

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

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

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

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS, BRIG. GEN (MD) RANDOLPH MILLHOLLAND ARMORY HAGERSTOWN, MD
PROJECT NO. 55-ML-01ED-03

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

2. CONCLUSIONS.

a. Lead. All air samples are below the laboratory analytical detection limit for lead in air of 0.004 mg/m³ and 0.006 mg/m³. Two surface dust-lead samples in the storage area (old firing range area) exceeded the USACHPPM recommended decontamination levels. These elevated levels of dust-lead exist on surfaces frequently contacted by the general workforce. Workers involved in renovation and abatement activities may be occupationally exposed to lead. There is a significant health risk to children from lead in surface dust in the storage room (old firing range) area.

b. Ventilation. The old and new central HVAC systems are not well balanced.

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. Lead. The RAC for this armory for Lead Exposure is classified as 4. To minimize lead exposure, clean all of the storage area (areas of the old firing range) where sampling results showed elevated levels of lead. Comprehensive guidelines for cleaning are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. There is a risk of contaminating items stored in the storage room with lead dust. Do not store medical, food or clothing items in this area until the area has been decontaminated. 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

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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.

b. Ventilation. A mechanical engineer should review the design of the HVAC systems.

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

REPLY TO
ATTENTION OF

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

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

LOCATION: Brig. Gen (MD) Randolph Millholland Armory, Hagerstown, MD

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

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

3. BACKGROUND INFORMATION.

a. Armory Mission. 729th Support Battalion (FSB) and Organizational Maintenance Shop#7A. Forward Support Battalion, supply and maintenance, logistics.

b. Date of Construction. The original building was built in 1979. One half of the building was renovated in 1997.

c. POC. SFC [redacted] 301-791-4028.

d. Survey Date: 12 August 2003.

4. SUMMARY OF ACTIONS.

a. Sampling. Surface wipe, air and bulk samples were collected to determine the existence of lead-based paint and/or lead-based paint hazards (paint-lead hazards). Sample locations are in Appendix D.

b. Physical Condition of Facilities.

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(1) Paint. The paint was in good condition. The old section of the building has all new tile and new paint on the walls.

(2) Asbestos. Staff Sergeant [redacted], Environmental Compliance Assessment Coordinator for the MD NGB, stated that all asbestos had been abated.

(3) Mold. SCF [redacted] stated that there have been no problems with mold. The roof had leaked in the drill area at one time but the roof was fixed.

(4) Safety Hazards. No safety hazards were observed.

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

d. Heating, Ventilation, and Air-conditioning System. Both the original and renovated areas of the building have their own HVAC systems. The original and new central HVAC systems are not well balanced.

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

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

g. Converted indoor firing range (IFR). Staff Sergeant [redacted] stated that lead in the converted indoor firing range was not abated during its conversion. It is now being used as a storage area.

h. Photographs. (Appendix C).

i. Site Maps. (Appendix B).

j. Facility use by children. This armory is periodically rented for youth sports, family support groups, and public activities.

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

6. SAMPLING RESULTS. Lead in air and surface wipe sample results are in Appendix D. All air sample results were below the laboratory analytical detection limits of 0.004mg/m³ and 0.006mg/m³ lead in air. Two of 15 surface wipes exceeded the USACHPPM

recommended decontamination level of 200 µg/ft² for floors and other frequently-contacted surfaces. (photo #s 1472 and 1474). These two wipe samples exceeded the EPA lead exposure levels for children under 6.

7. DISCUSSION. Both surface wipe samples exceeding USACHPPM decontamination guidance were collected in the area of the converted indoor firing range. One was collected on the floor near the old IFR, which has been renovated as a storage room (1472). The other was from the floor where the IFR baffle used to be (1474). These wipe samples exceeded the EPA lead exposure levels for children. EPA regulations define dust-lead standards for young children in child-occupied facilities. The EPA standard for dust-lead on floors is 40 µg/ft², and 100 µg/ft² for dust-lead on window sills. These levels were developed for children under 6 spending at least 60 hours per year in pre-1978 facilities. Two surface dust-lead samples collected in this armory greatly exceeded these standards. Although this armory does not meet the EPA definition of child-occupied facility's minimum time requirement for child use, USACHPPM believes that there is a potential hazard for children using this facility. AR 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them. Although this facility may comply with EPA and Army regulations, exposures for children under 6 may exceed those that the regulations are intended to prevent.

8. CONCLUSIONS.

a. All air samples are below the laboratory analytical detection limit for lead in air of 0.004 mg/m³ and 0.006 mg/m³.

b. Two surface dust-lead samples in the old IFR area exceeded the USACHPPM recommended decontamination levels. These elevated levels of dust-lead exist on surfaces frequently contacted by the general workforce.

c. Workers involved in renovation and abatement activities may be occupationally exposed to lead.

d. There is a significant health risk to children from lead in surface dust in the old firing range (storage) area.

e. There is a risk of contaminating items stored in the storage room with lead dust.

f. The old and new central HVAC systems are not well balanced.

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9. RECOMMENDATIONS. Enclosure.

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

[redacted]

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

ENCLOSURE

HAGERSTOWN ARMORY RECOMMENDATIONS

The Department of Defense Instruction Number (DODI) 6055.1 provides Risk Assessment Codes (RAC) for Health Hazards, a procedure which allows us to assess the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and combines the hazard severity and accident probability into a single numeral. RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority. The RAC for this armory for Lead Exposure is classified as 4.

a. Clean all areas in the storage room (old renovated indoor firing range) area where sampling results showed elevated levels of lead. Comprehensive guidelines for cleaning are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup.

b. There is a risk of contaminating items stored in the storage room with lead dust. Do not store medical, food or clothing in this area until the area has been decontaminated.

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

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

e. Test drinking water from water fountains and faucets for lead. It could not be determined if this has been done.

f. Address all potential lead hazards before extending this facility to use for children.

g. A mechanical engineer should review the design of the HVAC systems.

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MDARNG Facilities IH Baseline Surveys, BG Randolph Millholland Armory, Hagerstown, MD
Project No. 55-ML-01ED-03

APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

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Subject: Proposed Recommendations for Surface Lead in Armories

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

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

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

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

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

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

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

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

APPENDIX B

SITE MAPS

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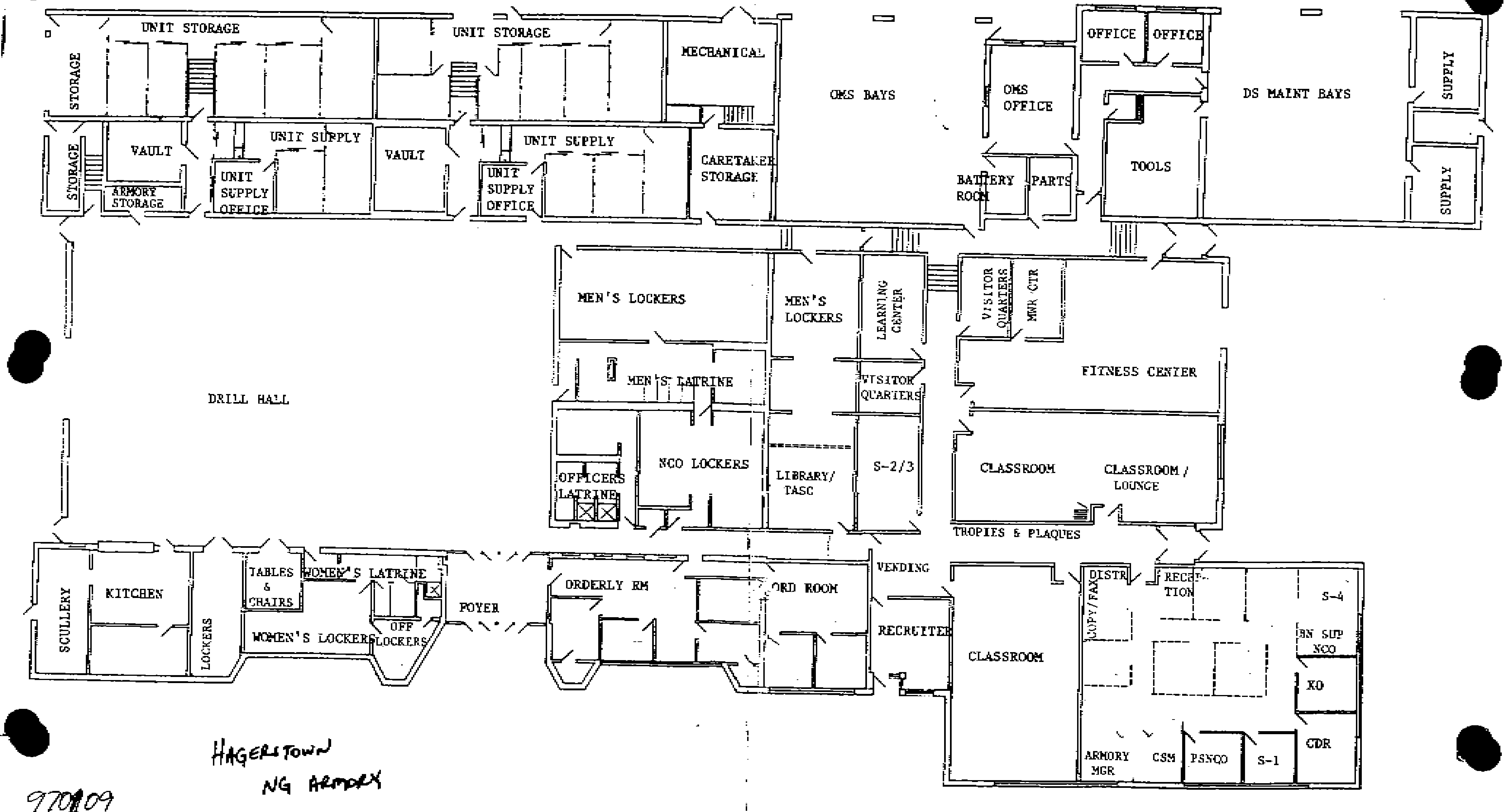
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UNIT STORAGE
MECHANICAL
STORAGE
OMS BAYS
OFFICE
OFFICE
OMS OFFICE
DS MAINT BAYS
SUPPLY
VAULT
UNIT SUPPLY
VAULT
UNIT SUPPLY
CARETAKER STORAGE
STORAGE
ARMORY STORAGE
UNIT SUPPLY OFFICE
UNIT SUPPLY OFFICE
BATTERY ROOM
PARTS
TOOLS
SUPPLY
MEN'S LOCKERS
MEN'S LOCKERS
LEARNING CENTER
VISITOR QUARTERS
MWR CTR
FITNESS CENTER
MEN'S LATRINE
VISITOR QUARTERS
DRILL HALL
NCO LOCKERS
OFFICERS LATRINE
LIBRARY/ TASC
S-2/3
CLASSROOM
CLASSROOM / LOUNGE
TROPIES & PLAQUES
SCULLERY
KITCHEN
LOCKERS
TABLES & CHAIRS
WOMEN'S LATRINE
WOMEN'S LOCKERS
OFF LOCKERS
FOYER
ORDERLY RM
ORD ROOM
VENDING
RECRUITER
CLASSROOM
COPY/FAX
DISTR
RECEP- TION
S-4
BN SUP NCO
XO
CDR
ARMORY MGR
CSM
PSNCO
S-1
HAGERSTOWN
NG ARMORY
970109

APPENDIX C

PHOTOGRAPHS

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Photo Number	Photo Location
1469	Supply room for tables and chairs
1470	Kitchen supply room (refrigerators)
1471	Kitchen preparation counter
1472	Storage room- near front of former IFR
1473	Floor outside door of former IFR
1474	Floor near former baffle of IFR
1475	Room 113 floor
1476	Drill area floor near kitchen
1477	Wall near 123 in drill area
1478	Floor at bottom of steps to food storage area near room 123
1479	Mold on tile in same area as food storage
1480	Lobby area table
1481	HQ office (729th) top of cabinets

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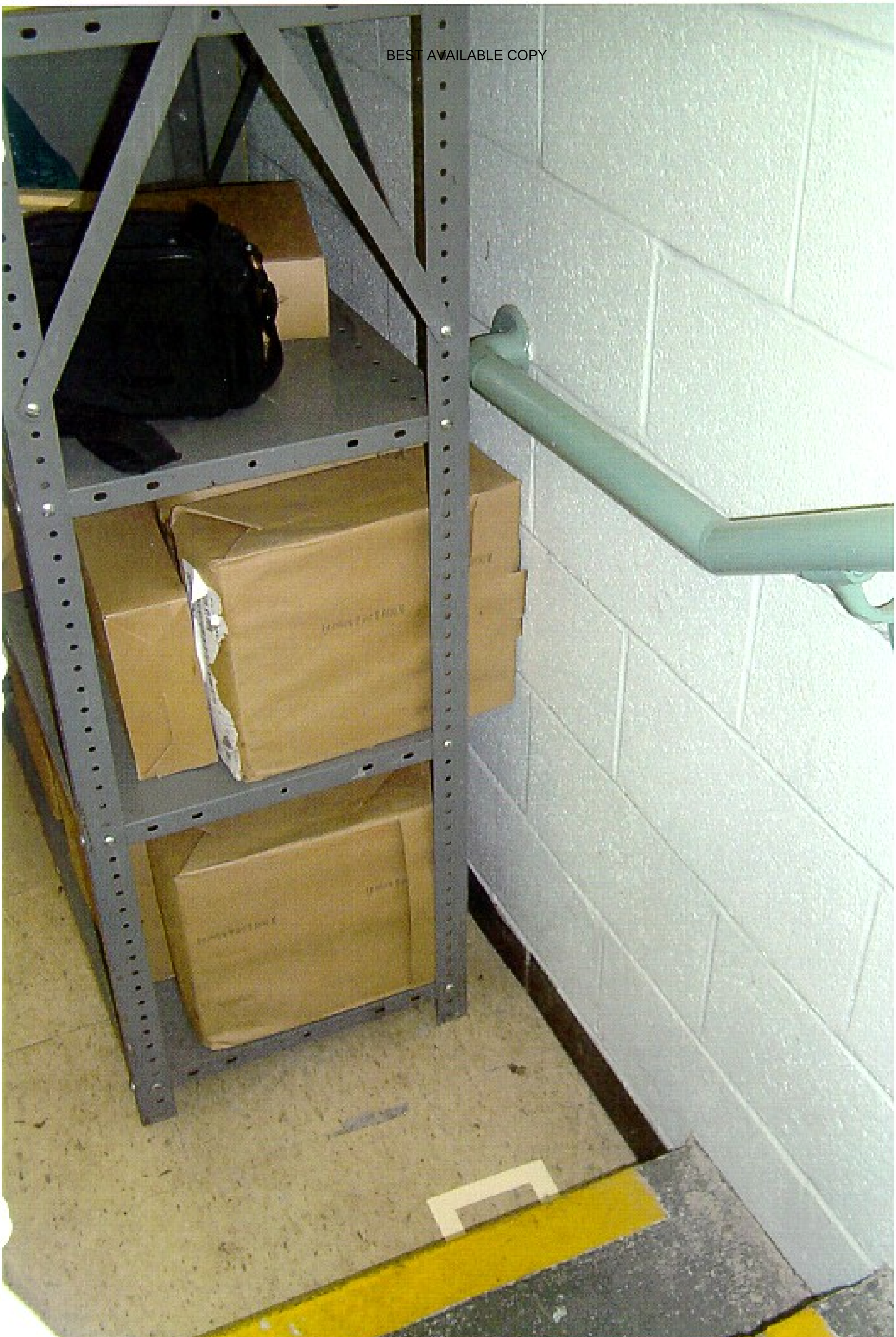

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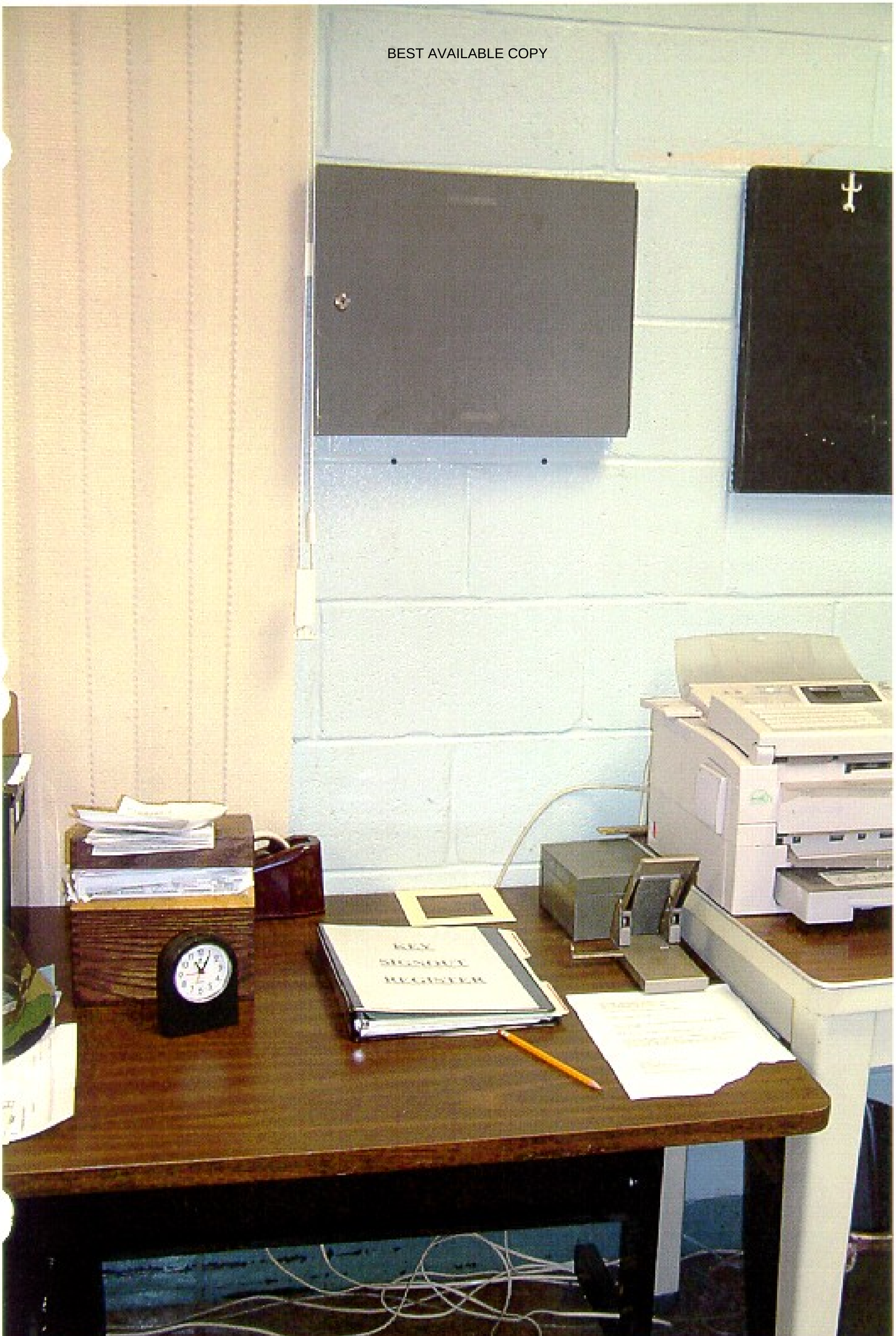

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APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

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			Indoor Range Info					
Wipe Sample #	**Armory**	**City**	**Active**	**Inactive**	**N/A**	**Cleaned?**	**Location of Samples**	**Conc. (µg/ft²)**
HGW01	Hagerstown	Hagerstown		Yes		Unknown	Floor of Room 107 Supply Room	BDL
HGW02	Hagerstown	Hagerstown					Floor Kitchen Supply Room (Refrig)	BDL
HGW03	Hagerstown	Hagerstown					Preparation Counter in Kitchen	BDL
HGW04	Hagerstown	Hagerstown					Floor in front of former IFR	232
HGW05	Hagerstown	Hagerstown					Floor outside door to former IFR	BDL
HGW06	Hagerstown	Hagerstown					Floor near where baffle used to be	2545
HGW07	Hagerstown	Hagerstown					Floor in Room 113	BDL
HGW08	Hagerstown	Hagerstown					Drill area floor near kitchen	BDL
HGW09	Hagerstown	Hagerstown					Wall near 123 in drill area	BDL
HGW10	Hagerstown	Hagerstown					Floor at bottom of steps to food dtorage area (Room 123	24
HGW11	Hagerstown	Hagerstown					Table in lobby area	BDL
HGW12	Hagerstown	Hagerstown					Top of cabinets in HQ office (729th)	BDL
HGW13	Hagerstown	Hagerstown					Floor unde windows in OMS office	BDL
HGW14	Hagerstown	Hagerstown					Desktop in OMS office	BDL
HGW15	Hagerstown	Hagerstown					Top of desktop cabinet in office on new side of OMS	BDL

DATA CHEM LABORATORIES, INC.

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

Reference Data:	**Lead**
Client Sample No.:	HGAS01 through HGBlank03
P.O. No.:	Not Available
Sample Location:	Hagerstown NG Armory
Sample Type:	Filter
Method Reference:	NIOSH 7300
DCL Set ID No.:	03-S-4147
DCL Sample ID No.:	03-25415 through 03-25421
Sample Receipt Date:	8/27/2003
Preparation Date:	08/27/03
Analysis Date:	08/27/03

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

The sample condition upon receipt was acceptable except where noted.

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

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

[redacted]
Analyst

[redacted]
Reviewer

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

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

Results
Lead

Client #	DCL #	Sample Volume (L)	µg/sample	mg/m^3
HGAS01	03-25415	270.6	ND	<0.004
HGAS02	03-25416	277.4	ND	<0.004
HGAS03	03-25417	175.4	ND	<0.006
HGAS04	03-25418	181.3	ND	<0.006
HGBlank01	03-25419	0	ND	-
HGBlank02	03-25420	0	ND	-
HGBlank03	03-25421	0	ND	-
	Prep Blank		ND	
% Recovery	LCS		101.	
RPL			**1.**	

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

[redacted]
Analyst

[redacted]
Reviewer

DATA CHEM LABORATORIES, INC.

ANALYTICAL REQUEST FORM

☐ **REGULAR** Status (5 working days from receipt)

☑ **RUSH** Status Required - ADDITIONAL CHARGE

RESULTS REQUIRED BY 27 AUGUST 2003 (DATE)

CONTACT DATACHEM LABS PRIOR TO SENDING SAMPLES

Date 22 August 2003 Purchase Order No. ______

Quote No. ______

Company Name COMMANDER, USACHPPM ATTN: MCHB-TS-OFS

Address 5158 BLACKHAWK ROAD APG, MD 21010-5403

City [redacted]

Person to Contact [redacted]

Telephone (410) 436-5475

Fax Telephone (410) 436-5471

Billing Address (if different from above)

Sample Collection

Sampling Site HAGERSTOWN NG Armory

Industrial Process ______

Date of Collection 12 Aug 03

Time Collected ______

Date of Shipment ______

QC Requirements ☐ Standard ☐ Other

Collector's [redacted]

Signature [redacted]

REQUEST FOR ANALYSES 03-S-4147

Laboratory Use Only	Client Sample Number	Media Type*	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
03-25415	HGAS01		270.6	LEAD NIOSH 7300
25416	HGAS02		277.4	" "
25417	HGAS03		175.4	" "
25418	HGAS04		181.3	" "
25419	HG BLANK01			
25420	HG BLANK02			
25421	*HGASBlank03			
				* Added per client submission + phone conversation 8/27/03 10:30

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
[redacted]	22 AUG 2003	[signature]	8/27/03 10:10
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time

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:	**RES**
Subcontract Number:	**NA**
Laboratory Report:	**RES 96612-1**
Project Description:	**None Given**
	Hagerstown Armory

[redacted]
Army National Guard IH - West
3401 Quebec Street, Suite 7200
Denver CO 80207

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association, Lab ID 101533 - Accreditation Certificate #480. The laboratory is currently proficient in both PAT & ELPAT programs respectively.

Reservoirs has analyzed the following sample(s) using Atomic Emission Spectroscopy - Inductively Coupled Plasma (AES-ICP) per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the analysis table. Results have been sent to your office.

RES 96612-1 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.

[redacted]
President

DATA CHEM LABORATORIES, INC.

TEST REPORT
Page 1 of 2
8/27/03

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

Reference Data:	**Lead**
Client Sample No.:	HGAS01 through HGBlank03
P.O. No.:	Not Available
Sample Location:	Hagerstown NG Armory
Sample Type:	Filter
Method Reference:	NIOSH 7300
DCL Set ID No.:	03-S-4147
DCL Sample ID No.:	03-25415 through 03-25421
Sample Receipt Date:	8/27/2003
Preparation Date:	08/27/03
Analysis Date:	08/27/03

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

The sample condition upon receipt was acceptable except where noted.

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

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

[redacted]
Analyst

[redacted]
Reviewer

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

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

Results
Lead

Client #	DCL #	Sample Volume (L)	µg/sample	mg/m^3
HGAS01	03-25415	270.6	ND	<0.004
HGAS02	03-25416	277.4	ND	<0.004
HGAS03	03-25417	175.4	ND	<0.006
HGAS04	03-25418	181.3	ND	<0.006
HGBlank01	03-25419	0	ND	-
HGBlank02	03-25420	0	ND	-
HGBlank03	03-25421	0	ND	-
	Prep Blank		ND	
% Recovery	LCS		101.	
RPL			1.	

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

Non-Responsive
[redacted]

Non-Responsive
[redacted]

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 96612-1**
Client:	**Army National Guard IH - West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**Hagerstown Armory**
Date Samples Received:	**August 19, 2003**
Analysis Type:	**USEPA SW846 3050B / AA(7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 22, 2003**

Client ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
HGBLANK1	EM 806527	0.11	BDL	23	BDL
HGBLANK2	EM 806528	0.11	BDL	23	BDL
HGW01	EM 806529	0.11	BDL	23	BDL
HGW02	EM 806530	0.11	BDL	23	BDL
HGW03	EM 806531	0.11	BDL	23	BDL
HGW04	EM 806532	0.11	25.5	23	232
HGW05	EM 806533	0.11	BDL	23	BDL
HGBLANK3	EM 806534	0.11	BDL	23	BDL
HGW06	EM 806535	0.11	280.0	23	2545
HGW07	EM 806536	0.11	BDL	23	BDL
HGW08	EM 806537	0.11	BDL	23	BDL
HGW09	EM 806538	0.11	BDL	23	BDL
HGW10	EM 806539	0.11	2.6	23	24
HGW11	EM 806540	0.11	BDL	23	BDL
HGW12	EM 806541	0.11	BDL	23	BDL
HGW13	EM 806542	0.11	BDL	23	BDL
HGW14	EM 806543	0.11	BDL	23	BDL
HGW15	EM 806544	0.11	BDL	23	BDL

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

BDL = Below Detection Limit

Data Qa

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NGB-AVS-SI
Statement of Work, Armories

Form 4

Industrial Hygiene Surface Wipe Sample Sheet

Return Address		**Point of Contact** ***(name & phone #)***	
		[redacted] Non-Responsive	
Sampled Facility Hagerstown Armory	**City** Hagerstown	**State** MD	[redacted]
Description of Operation	**Date Collected**	**Date Shipped**	
Analysis Desired			

Sampling Data

Lab Use Only	Sample #	Results ug/ft^2	Remarks
	HGW01	BDL	room 107 supply room for tables/chairs on floor
	HGW02	BDL	Floor kitchen supply room (refrigerator)
	HGW03	BDL	Preparation counter in kitchen
	HGW04	232	Floor near front of old IFR
	HGW05	BDL	Floor outside door to old IFR
	HGW06	2,545 ~~BDL~~	Floor near where baffle used to b(e)
	HGW07	BDL	Floor in room 113
	HGW08	BDL	Drill area floor near kitchen
	HGW09	BDL	Wall near 123 in drill area
	HGW10	24	Floor at bottom of steps to FOOD STORAGE area (Room near 123)
	HGW11	BDL	Table in Lobby area
	HGW12	BDL	TOP OF Cabinets in HQ OFFICE (729th)

Comments to Lab:

Form 4

Industrial Hygiene Surface Wipe Sample Sheet

Return Address		**Point of Contact** ***(name & phone #)***	
		Samples Collected By	
Sampled Facility Hagerstown Armory	**City** Hagerstown	**State** MD	**Location** ***(bldg/area)***
Description of Operation		**Date Collected**	**Date Shipped**
Analysis Desired			

Sampling Data

Lab Use Only	Sample #	Results	Remarks
	HGW13	BDL	Floor under window in OMS office
	HGW14	BDL	DESKTOP IN OMS office
	HGW15	BDL	TOP OF DESKTOP Cabinet
			in office on new side of OMS

Comments to Lab:

APPENDIX E

REFERENCES

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APPENDIX E

REGULATIONS AND STANDARDS

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

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

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

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

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

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

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

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

APPENDIX F

LEAD CLEANING GUIDANCE

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CHAPTER 14: CLEANING

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.

2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.

3. Have sufficient cleaning equipment and supplies *before* beginning work.

4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.

5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.

6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.

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

8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.

9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.

10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.

11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.

12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.

13. Paint or otherwise seal treated surfaces and interior floors.

14. Conduct a clearance examination (see Chapter 15).

15. If clearance is not achieved, repeat the final cleaning.

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Step-by-Step Summary (continued)

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

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

18. Cleaning equipment list:

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

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Chapter 14: Cleaning

I. Introduction

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

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

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

A. Performance Standard

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

B. Small Dust Particles

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

C. Difficulties in Cleaning

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

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

1. Low Clearance Standards

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

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

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

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

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2. Worker Inexperience

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

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

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

4. Deadlines

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

II. Coordination of Cleaning Activities

A. Checklist

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

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?
- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

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

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C. Waste Disposal

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

III. Cleaning Methods and Procedures

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

A. Containment

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

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

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

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

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

1. HEPA Vacuuming

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

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

Operating Instructions

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

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

Special Attachments

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

Selecting Appropriate Size(s)

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

Wet-Dry HEPA Vacuums

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

Prefilters

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

HEPA Vacuuming Procedures

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

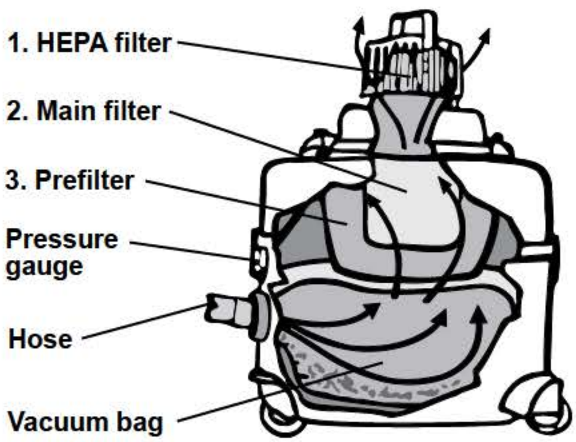
To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture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

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

Emptying the HEPA Vacuum

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

Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

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

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

2. Wet Detergent Wash

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

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

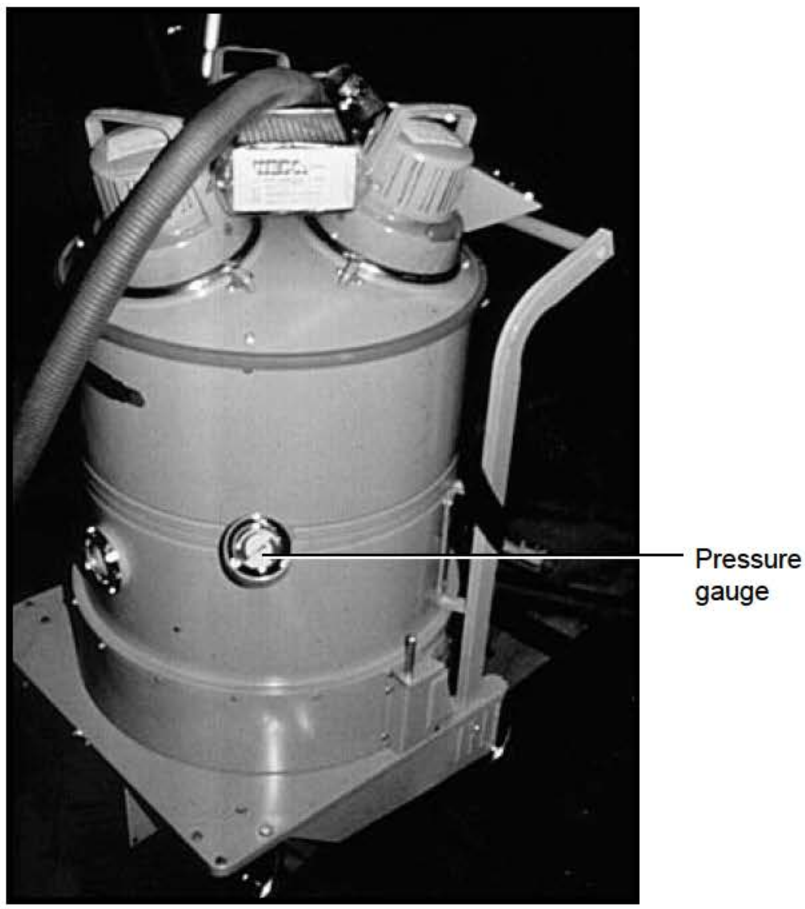
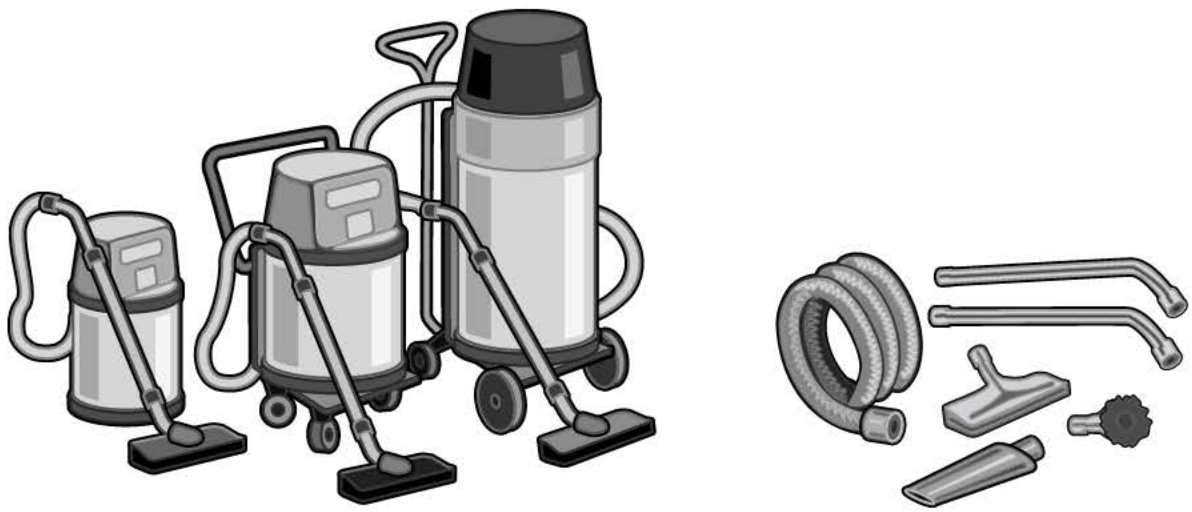


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

Figure 14.2 HEPA Vacuum Sizes and Tools.



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

Manufacturer's Dilution Instructions

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

Appropriate Cleaning Equipment

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

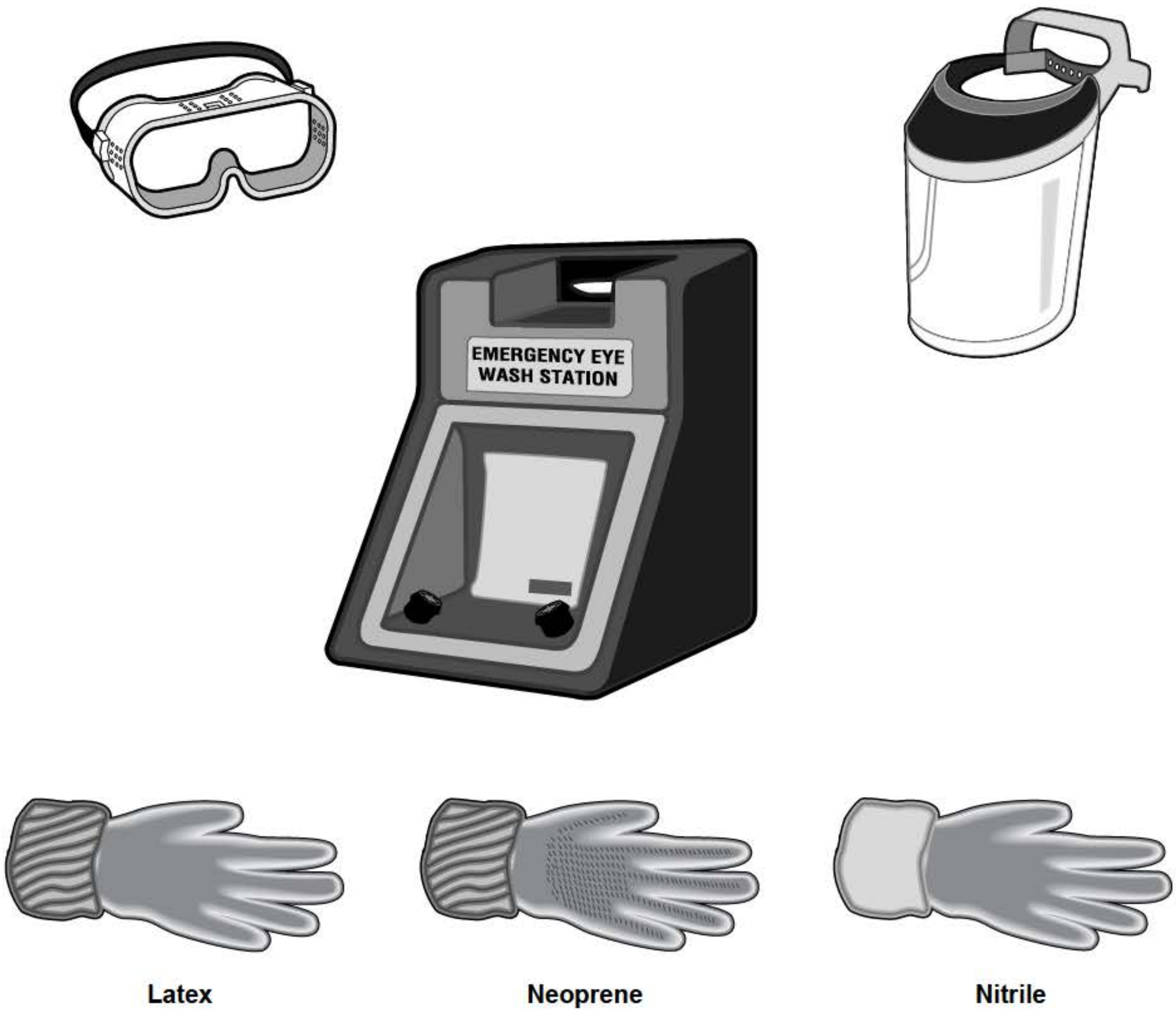
Proper Wet-Cleaning Procedures

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

Changing Cleaning Mixture

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

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



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

3. The HEPA/Wet Wash/HEPA Cycle

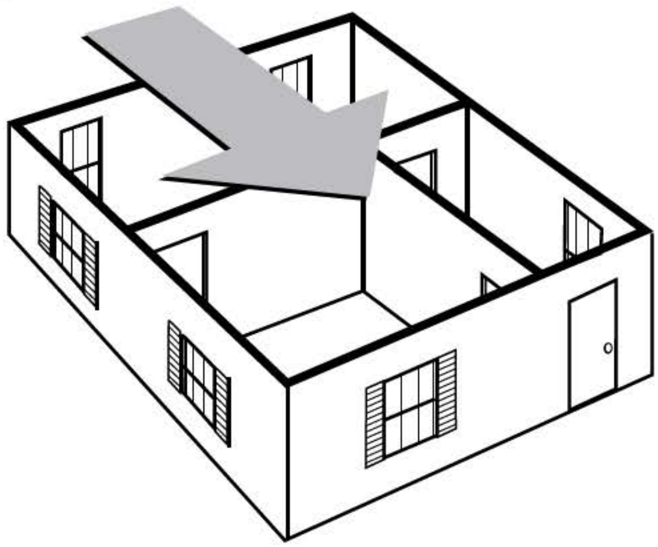
Typical Procedures

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

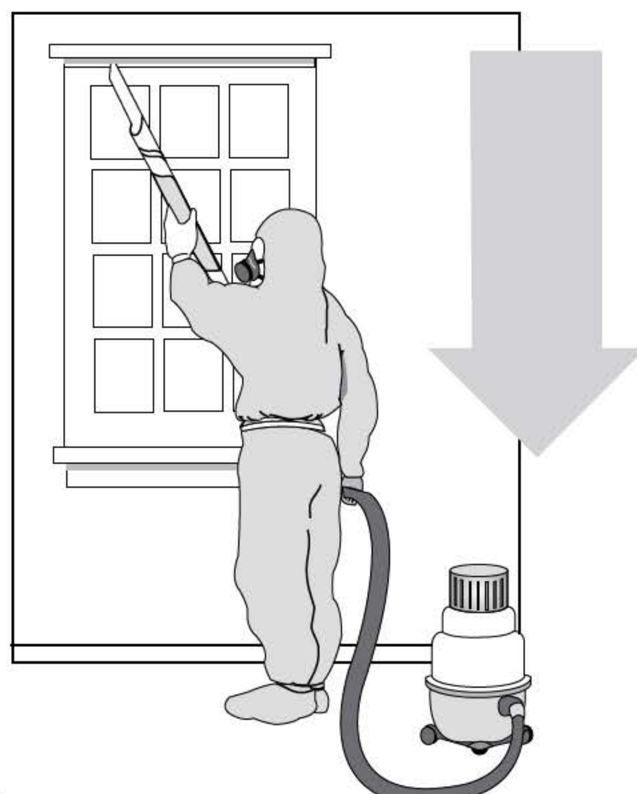
- First, the area is HEPA vacuumed.

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

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



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



Courtesy: Alice Hamilton Occupational Health Center

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

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

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

Single-Pass Wet Wash/HEPA Vacuum

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

Figure 14.4b (continued)

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

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

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

Rubber Cone

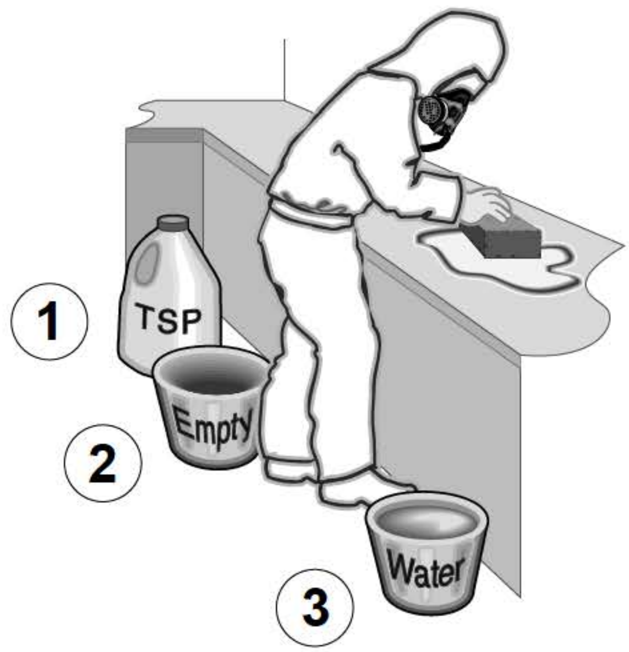
Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

Figure 14.4c (continued)

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



Wipe All Surfaces

Wet Mop Floor

Don't Dry Sweep

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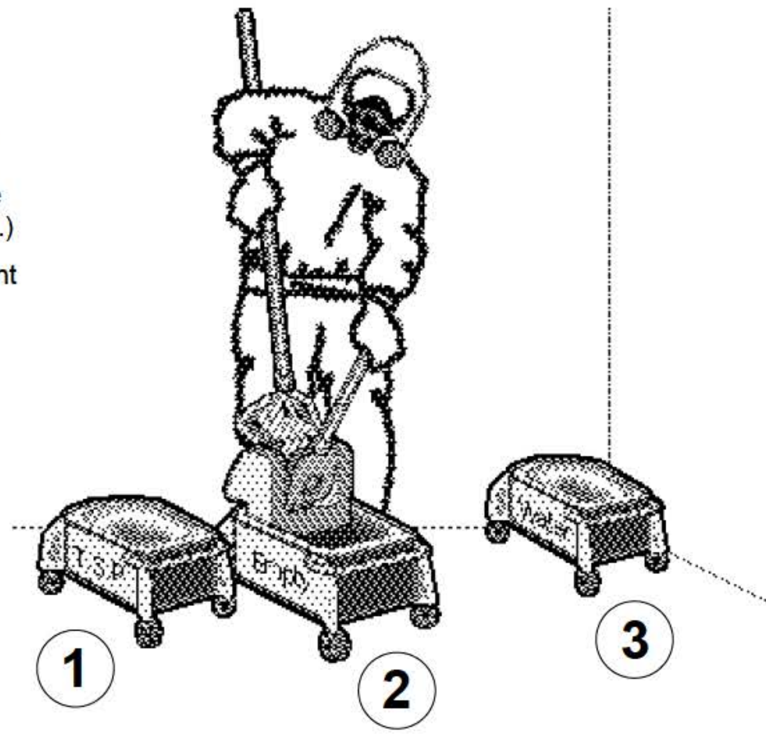
Figure 14.4c (continued)

Use the 3-Bucket System.

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

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



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

Use the third bucket for rinsing the floor.

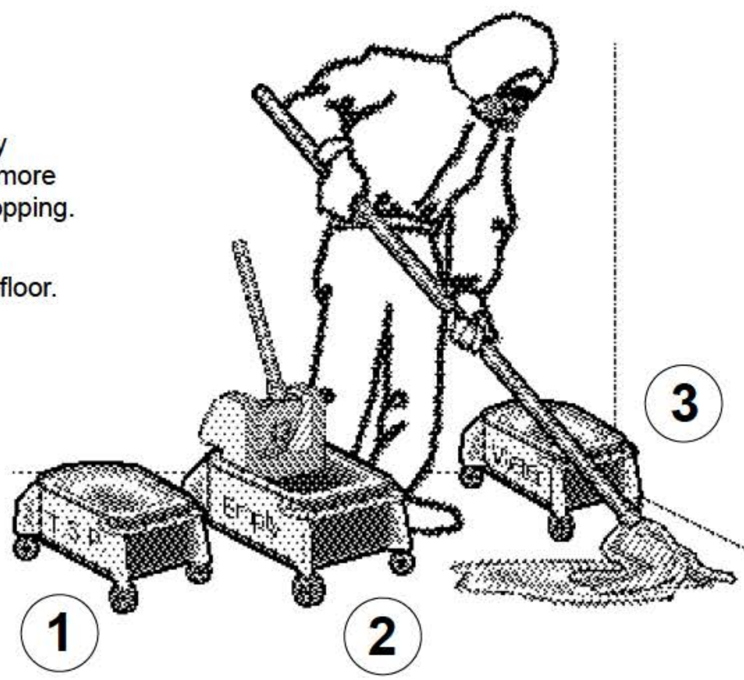
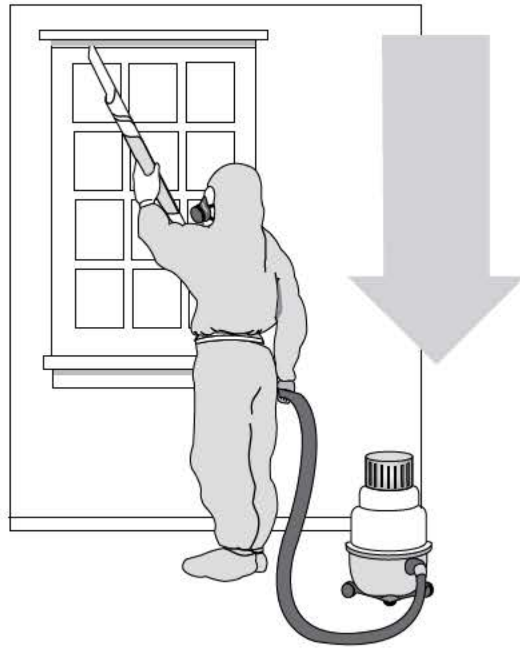


Figure 14.4d (continued)

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

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



4. Sealing Floors

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

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

IV. Order of Cleaning Procedures During Lead Hazard Control

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

A. Precleaning Procedures

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

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

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

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

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

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

B. Ongoing Cleaning During the Job

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

C. Daily Cleaning Procedures

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

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

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

1. Large Debris

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

2. Small Debris

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

3. Exterior Cleaning

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

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

4. Worker Protection Measures

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

5. Maintaining Containment

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

V. Order of Final Cleaning Procedures After Lead Hazard Control

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

A. Final Cleaning

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

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

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

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

1. Decontamination of Workers, Supplies, and Equipment

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

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

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

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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

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

B. Preliminary Visual Examination

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

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

C. Surface Painting or Sealing of Nonfloor Surfaces

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

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

D. Final Inspection

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

E. Recleaning After Clearance Failure

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

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

VI. Cleaning Cost Considerations

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

A. Initial Clearance Test Failure Rates

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

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

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

B. Key Factors In Effective Cleaning

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

C. Special Problems

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

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

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

VII. Alternative Methods

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

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

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

A. Vacuums

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

B. Trisodium Phosphate and Other Detergents

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

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

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

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

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

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

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

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

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

APPENDIX G

MOLD GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

TG 277

FEBRUARY 2002

USACHPPM

Readiness thru Health

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

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

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

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

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

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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)

REMEDIATION PROCEDURES

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

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

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

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

FOUR REMEDIATION LEVELS

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

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

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

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

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

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

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

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

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

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

The following procedures *at a minimum* are recommended:

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

Refer to Appendix D for Containment procedures.

The work area and areas directly adjacent should be covered with a single layer of 6 mil fire-retardant polyethylene sheet(s) and taped before remediation, to contain dust/debris.

Seal ventilation ducts/grills in the work area and areas directly adjacent with 6 mil polyethylene sheeting. Use an exhaust fan with a High Efficiency Particulate Air (HEPA) filter to generate negative pressurization.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

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

The work area and surrounding areas should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

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

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level III be followed.

Level III: Large Area – Total Surface Area affected greater than 100 square feet or potential for increased occupant or remediator exposure during remediation is estimated to be significant. (See Appendix B for detailed guidance).

The following procedures are recommended:

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from occupied spaces using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft^2) follow Level I guidance for PPE and containment and for a areas (>10 ft^2) follow Medium (Level II) or when greater than 100 ft^2 follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

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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

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.

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

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

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

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water Damage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£	
Water-Damaged Material†	**Actions**
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours§	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans.
Ceiling tiles	• Discard and replace.
Cellulose insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	• Discard and replace.

Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling should be pried away from wall for drying

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£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.

These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

† If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

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APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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USACHPPM
Readiness thru Health

Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278
February 2002

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*[1] will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination[2].

Safety Tips While Investigating and Evaluating Mold and Moisture Problems[3]

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate[1].

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems[3].

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination[2].

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air[4]. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control[4]."

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program. For further mold assistance, contact USACHPPM, Industrial Hygiene Field Services Program, DSN 584-3118 or (410) 436-3118.

References

1. USACHPPM Technical Guide 277, *Army Facilities Management Information Document on Mold Remediation Issues*, February 2002.

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

3. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

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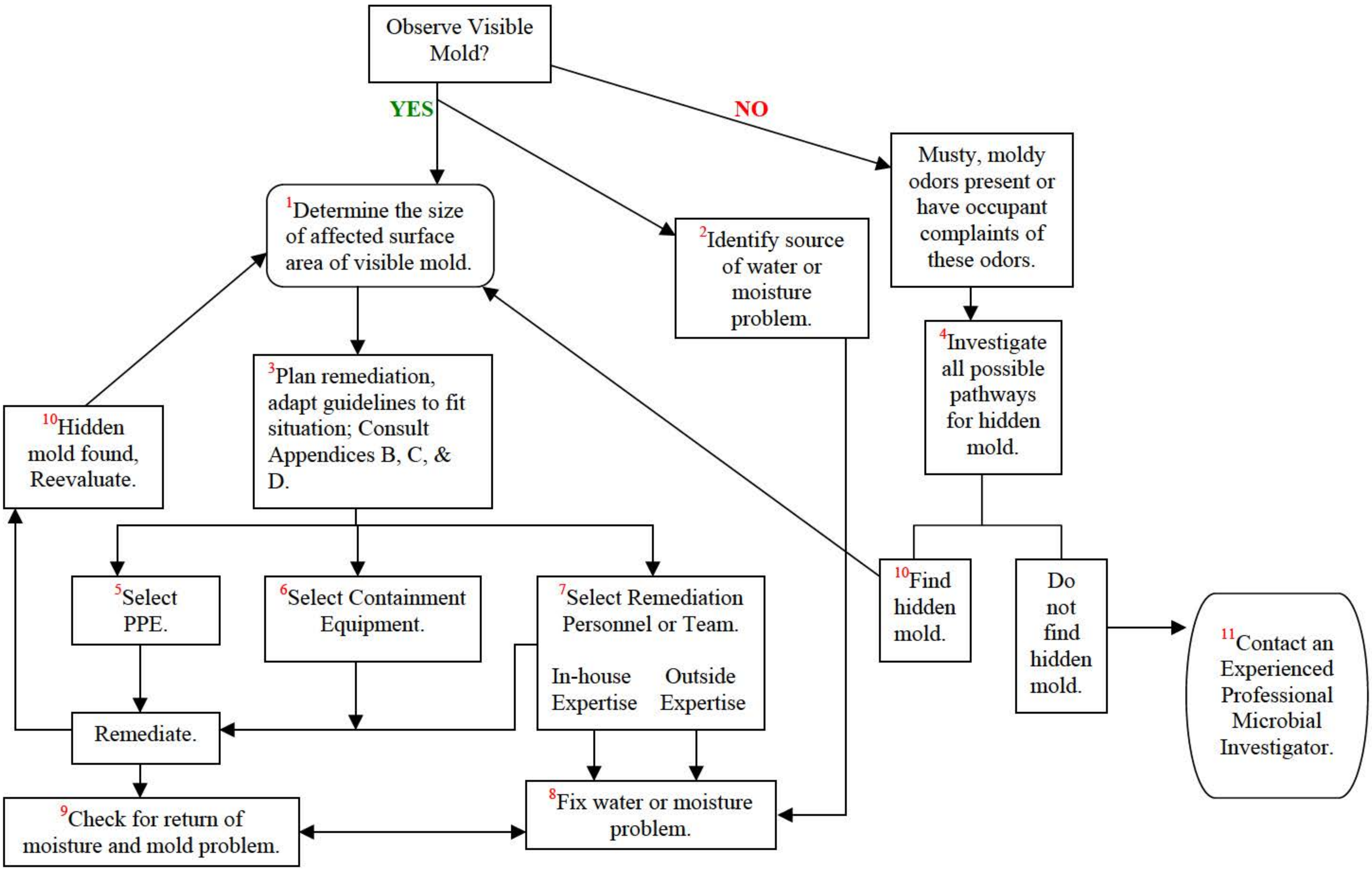
8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

MOLD INVESTIGATION DECISION LOGIC



MOLD INVESTIGATION DECISION LOGIC NOTES:

1. Roughly approximate the total surface area of visible mold. Categorization of the remediation levels are sometimes borderline, so when trying to decide the category to apply, consider the extent of visible growth, such as a heavy blanket of growth on the surface, to barely visible. If heavy growth is apparent, consider moving up to the next level of protection.

2. Do not skip this step. Address the source of water or moisture problem or the mold will simply reappear.

3. Always protect the health and safety of the building occupants and remediators.

4. Mold may be hiding on the backside of drywall, vinyl wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads. Check walls behind furniture, pipe chases and utility tunnels, porous thermal or acoustic liners inside ductwork, or check the rafters (due to roof leaks or insufficient insulation)[3].

5. Utilize appendices B and C for remediation guidance. Use your best judgment during investigations, if not disturbing the mold you may need minimal to no PPE. Do not alarm building occupants unnecessarily, but protect yourself as necessary.

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities[3]. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
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Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
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Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
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Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

®TYVEK, DuPont de Nemours, E.I., & Co., Wilmington, DE.

APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Readiness thru Health

IES ENGINEERS

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

March 24, 2009

<u>E-MAIL</u>
Ms. [redacted]
Army National Guard
ATTN: NGB-ARS-IHNE
301-IH Old Bay Lane
Havre de Grace, MD 21078

Subject: Final Industrial Hygiene Assessment Report
Hagerstown Readiness Center, Hagerstown, Maryland
IES Project No. EHS08794.02

Dear [redacted]:

IES Engineers (IES) is pleased to enclose the final report of the Industrial Hygiene assessment conducted at the Army National Guard Readiness Center facility located in Hagerstown, Maryland. Thank you for the opportunity to perform this assessment. Please contact me if you should you have any questions or require any additional information.

Sincerely,

[redacted], CIH
Senior Manager, Health, Safety & Industrial Hygiene Services

cc: [redacted], IES

IES ENGINEERS

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

FINAL
INDUSTRIAL HYGIENE ASSESSMENT
HAGERSTOWN READINESS CENTER
18500 ROXBURY ROAD, HAGERSTOWN, MARYLAND 21740
SURVEY DATE: JULY 17, 2008

IES PROJECT NO. EHS08794.02
REPORT DATE: MARCH 24, 2009

Prepared and submitted by:

[redacted] Non-Responsive
[redacted]
Senior Project Manager

Certified Industrial Hygienist review by:

[redacted]
[redacted], CIH
Senior Manager, Health, Safety & Industrial Hygiene Services

IES ENGINEERS

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IES ENGINEERS

1.0 EXECUTIVE SUMMARY

1.1 Introduction

Assessment Date: July 17, 2008

Purpose: The National Guard Bureau (NGB) retained IES Engineers (IES) to assist in performing an Industrial Hygiene assessment at the Army National Guard (ARNG) Readiness Center (RC) located at 18500 Roxbury Road in Hagerstown, 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 Hagerstown RC facility. Mr. [redacted], CIH, Senior Project Manager of IES, performed the assessment. Assessment activities were conducted with reference to the Statement of Work – Industrial Hygiene Services for National Guard Bureau Industrial Hygiene Region North Baseline Surveys for Readiness Centers and Administrative Buildings, May 2008, and included:

1) Dust sampling and analysis for lead surface contamination,
2) Air sampling and analysis for lead (to determine administrative personnel exposure to airborne lead),
3) Bulk sampling of suspected asbestos-containing building materials, or lead-containing paint (where advised),
4) Physical (visual) site inspection of all internal building areas to note condition of materials, particularly those suspected to be lead or asbestos-containing, as well as potential water-damaged materials, housekeeping conditions and related safety hazards, ergonomic considerations, and indicators of indoor air quality.
5) Measurements of relative humidity, carbon dioxide and temperature in occupied areas of each floor, as well as lighting supporting evaluation with respect to indoor environmental standards,
6) Visual inspection and/or measurement of ventilation systems within the readiness center (general and local exhaust), as pertinent, supporting evaluation of indoor air quality and maintenance procedures,
7) Evaluation of attached garages, within the scope of readiness center operations, with respect to visual examination, hazards present, and observation/documentation of controls utilized including administrative, personal protective equipment and ventilation controls, and associated impact upon readiness center operations.

Conferred With: Captain [redacted], Administrative Supervisor, Hagerstown RC

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1.2 Facility Description

The Hagerstown RC is located at 18500 Roxbury Road, Hagerstown, Maryland, and is primarily designed and operated as a 34,309 square foot training facility, which includes an original section constructed in 1978 (22,699 square feet), plus an addition constructed in 1997 (11,610 square feet). The Hagerstown RC principally houses the Headquarters & Headquarters Company (HHC), 729th Support Batallion, which provides training, training support and administrative support to the Army National Guard. Predominant construction features of the facility include interior and exterior block masonry walls on concrete slab with brick exterior cladding, and insulated metal pan roof structure. Interior finishes included 12 inch square (12” x 12”) floor tile, or masonry tile floors, suspended fiber acoustic ceiling tile (2’ x 2’), and painted drywall partitions.

The RC includes: battalion headquarters, large classroom, administrative offices and orderly room, men’s and women’s locker and restrooms, drill room/floor, fitness center, distance learning center, computer/IT room and administrative office, family support office, kitchen, scullery and storage, military police vault, supply room, and split level storage area (old rifle range), HHC vault, supply room and split level storage area, boiler room, caretaker storage room, maintenance bays (FMS 7), FMS office, FMS shop offices, break room, tool and parts rooms and battery storage room.

The facility is heated, ventilated, and/or air-conditioned by multiple systems. Heating, ventilation and air-conditioning (HVAC) service is achieved predominantly via roof-mounted package HVAC units with cooling condensers. Separate localized ventilation and heating with outdoor air intakes serve the drill room and other areas. Each restroom and locker area is local-exhaust ventilated to the roof. A boiler/circulating hot water heating system is used for heating throughout most of the facility, whether via HVAC, localized fan coil units, or wall mounted registers. A Mitsubishi package heating/air-conditioning unit is located in each supply room office. The FMS #7 break room (refer to description below) contains a separate, package HVAC unit, that serves this area, and fuel oil-fired radiant heaters in the maintenance (garage) bays.

The facility is occupied by 25 personnel. The full-time complement includes: 10 active guard reserve including administrative personnel and technicians, three full-time recruiters, and two military police. Three state workers include a full-time caretaker, and one person each serving the distance learning center, and the family assistance center. The caretaker provides routine maintenance and custodial service, but does not provide any service for HVAC systems. In addition, there are seven personnel assigned to the FMS 7 unit. Normal scheduled work operations occur between Tuesday through Friday, and between the hours 0630 to 1700. Training at the facility occurs monthly on weekends. On the day of the IH assessment, the facility was fully occupied by assigned personnel.

<u>Facility Maintenance Shop #7</u>

A maintenance/garage section is incorporated into this facility, as part of the 1997 addition; however, this section is not utilized directly by the HHC unit. The FMS #7 is a separately operated Unit, located at the Hagerstown RC facility.

<u>Please refer to Appendix A of this report for current photographs of facility areas/conditions</u>. Refer to subsequent report sections 1.3 – Key Findings and Conclusions, and 2.0 – Operation Description and Condition for further information.

1.3 Key Findings and Conclusions

Several key findings and conclusions were noted as follows:

<u>HVAC/Ventilation Service</u>

- Suspended particulate load on HVAC vents was noticeable in the Batallion Headquarters. This is likely due to ineffective filtration.
- Men's Locker Room was found with strong, disagreeable odor. The exhaust fan system serving the men's locker was not operational during the survey. The odor conditions may also indicate hidden plumbing problems, or pipe chase leaks.
- The HHC and MP supply offices do not have mechanical ventilation, but are served by package heating/air-conditioning units, designed to re-circulate air. Supply room personnel may close doors during hot or cold weather extremes, leading to inadequate ventilation.
- Exhaust fans were not operational in the Fitness Center.
- Water pooling was noticeable at intake areas of certain roof-mounted package units. This condition may lead to bioaerosol amplification, and distribution into the supply air stream.
- Roof-mounted HVAC equipment filters were found to seat in a channel, but are not tight-fitting. This condition may lead to excess particle build-up on cooling coils, leading to bioaerosol amplification.

<u>Facility Condition</u>

- Carpet on slab covered by rubber mat was found in the Fitnesss Center. This condition may lead to microbial growth, particularly during summer conditions with high relative humidity, or ineffective air exchange.
- Classroom S4 ceiling supply vents were found with rust, indicating frequent condensation. This may indicate inadequate humidity control or air exchange in the space.
- The HHC storage area was found with continuous operating heater/fan unit, apparently due to a faulty hot water circulation valve.
- Caretaker operates washing machine serving FMS 7 and HHC field laundry needs. Further evaluation of Caretaker procedures and potential environmental contaminants, is advised.
- The boiler chemical treatment program was found managed by off-site personnel.

<u>Sampling Results</u>

- Certain abandoned, isolated, duct components of the old firing range duct, which are not likely to be readily disturbed, were identified. The duct surfaces appeared to have been previously encapsulated. A small amount of residual, un-encapsulated dust is presumed to be present from the prior lead-abatement action. Sample analysis results indicate presence of significant levels of lead contamination in residual surface dust. This condition is not anticipated to constitute an immediate hazard to occupants, unless the interior duct surfaces are subjected to high airflow. The condition should be further investigated.

- Surface dust concentrations of lead slightly above the 200 µg/ft2 OSHA guideline were also identified at three (3) other sample locations including: HHC lower level storage area/ top of fan heater casing, HHC supply room, top of cage rail, and Batallion Headquarters, filter compartment. The contamination is anticipated to be salient, historical, undisturbed dust; however, further evaluation is advised.

- The drill hall floor appeared to be a wood or laminated composite. Bulk sampling results indicate there is “no asbestos detected” in the material.

Refer to Section 2.2 – Specific Site Survey and Conditions for further details.

Water Leaks

- Ceiling tile was found removed in the administrative area outside the NCO’s office, due to a roof drain leak. There is musty odor present in the space upon entry. The AGR personnel report this has been an ongoing problem.

- A section of the tectum ceiling in the drill hall appears water-damaged from previous or recurring leakage. The area of damage is estimated at no greater than 15% of ceiling area. The Caretaker reports there is no evidence of recurrent water leakage into the facility.

Security

- Potential unattended access into the facility from outside was noticeable. Unattended entry could readily occur through the MP lower storage entry to parking lot, and into the FMS 7 garage areas, during personnel breaks or unattended periods.

Other Ventilation

- Kitchen vent hoods serving stove and automatic dish/pot washing equipment were found functional. The general area was found clean. The kitchen is not routinely operated. Some water leakage was noticed on the floor associated with a refrigerator.

- Retractable vehicle exhaust ventilation ducts and hoods are located in each of the maintenance service (garage) bays, and found operational. Velocity measurements were collected at the FMS 7 ventilation exhaust hoods and are reported in Section 2.2 - Specific Site Survey and Conditions.

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EH&S Compliance & Support

- Caretaker is required to order cleaning and chemical products through the Pikesville Armory, "Garage 13." Caretaker reports distribution may not be timely, or product may be received in limited quantity, therefore, localized purchasing may occur. Material safety data sheets are not secured during these purchases.

- Current, up-to-date MSDS were not found on-site all chemical products in Caretaker's storage. The caretaker utilizes personal protection only to extent that such protection is voluntarily used (i.e., hearing protectors or glove protection may be used during chemical use, though no particular glove types were reported to be specified for certain jobs).

- A separate flammable storage room, containing flammable storage cabinets was found within the FMS 7 hallway area, and is managed by FMS 7 personnel. No obvious, visible deficiencies were found within the room or storage, except that combustible and flammable items may be inadvertently stored together.

- An outdoor portable truck wash/recycling system was observed on-site, in addition to other hazardous material storage (clean and separate waste oil, clean and waste anti-freeze, etc). System maintenance is managed by FMS 7 personnel, and is not monitored or used by readiness center personnel.

Illuminance Levels

- The average illuminance levels in several areas throughout the faciliy 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.

1.4 Recommendations

IES' recommendations resulting from this assessment, including the determination of the Risk Assessment Code (RAC) for occupational exposures, are included in a separate document entitled, "Hagerstown_RC_08_Recommendations."

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2.0 OPERATION DESCRIPTION AND CONDITION

INSTALLATION: RC Army National Guard
BUILDING: 18500 Roxbury Road, Hagerstown, Maryland
LOCATION: Facility-wide

2.1 General Description and Condition

OPERATION DESCRIPTION: On the day of the assessment, IES observed routine operations in progress. Unit operations at the Hagerstown RC facility include:
1) Headquarters and Headquarters Company (HHC) for 729th Brigade Support Batallion – Routine operations include administration, planning, supply, training preparation and associated training support and recruiting. The HHC operation, nor any other operation provides or utilizes the garage/vehicle maintenance facilities at this site. These are managed and operated by FMS #7. The Caretaker provides minor maintenance and custodial support for this facility, but does not provide any support for HVAC service. This includes cleaning interior facilities, floors and windows, minor repairs, changing light bulbs, minor floor maintenance, and outdoor grounds-keeping.
2) Detachment 1, Military Police Platoon, Special Troops Batallion – Administration, planning and support for military police operations.
3) Family Assistance Center – Support services for military families.
4) Distance Learning Center – Support for professional training and troop development.
5) Facility Maintenance Shop Unit # 7 – Provides all vehicle maintenance support for the region.

NOTE: Survey assessment activities were focused primarily on RC operations. General information was collected for FMS 7 operations, since these operations are separately managed, and not part of readiness center operations.

2.2 Specific Site Survey and Conditions

Various HHC personnel provided assistance to Mr. T. Hans Derr, Senior Project Manager of IES during and subsequent to the survey period, as coordinated by Mr. Bryan Hughes, NCO of the Hagerstown RC.

CHEMICAL AND PHYSICAL AGENTS SAMPLED: During the assessment, three personal samples for airborne lead were collected. These included two samples for HHC personnel, and one sample for an FMS 7 military technician conducting vehicle repair (a.m.), and administrative duties (p.m.). All sample results were reported less than the adjusted OSHA Permissible Exposure Limit, time-weighted average (PEL-TWA) standard of 40 $\mu g/m^3$ for a 10-hour work shift (refer to Section 3.1.2). 17 surface wipe samples were collected throughout the facility, at specified or suspect areas. Certain lead dust contamination was found in the HHC supply storage area and room, and from within a filter compartment of the HVAC unit serving the Batallion Headquarters. Surface dust analysis of samples collected from the HHC lower storage level, fan/heater unit casing were reported at 220 $\mu g/ft^2$, at the HHC storage room, top of cage rail, reported at 480 $\mu g/ft^2$, and at the Batallion

Headquarters filter compartment reported at 590 µg/ft^2 (refer to Section 3.2). These findings are anticipated to be salient conditions, and may constitute residual lead contamination related to operations during old firing range use; however, further evaluation is advised.

Facility paint was found in good condition, and no bulk samples were collected for analysis. One bulk sample for asbestos was collected of a suspect flooring material (drill floor). Sample results analysis for the suspect flooring material were reported as “no asbestos detected”.

General IAQ measurements (relative humidity, carbon dioxide, carbon monoxide and temperature) were made throughout the RC facility at 28 point locations, including maintenance/garage areas, supporting indoor air quality assessment. Refer to report sections 1.3 – Key Findings and Conclusions, and 3.0 – Sample Results and Measurements for details.

VENTILATION/ HEATING, VENTILATING & AIR-CONDITIONING (HVAC) SYSTEMS: Ventilating systems were found as follows:

- Roof HVAC equipment appeared operational. Three of five units were opened for inspection of the filter/return compartments, and sampling.
- Within the HHC supply storage, one heater/fan unit was found non-operational (fan remained in operation with apparent “bleed-through” hot water circulation causing unnecessary heat build-up within the area.
- The Mens’s locker room and fitness center exhaust/ventilation systems were found non-operational.
- Supply storage office, heating and air-conditioning (HAC) units (Mitsubishi), re-circulate room air only. No additional room ventilation is provided. Supply room supervisors leave doors closed to control heat infiltration, with potential CO_2 or stagnant air build-up.
- The kitchen is equipped with an outdoor, ambient make-up air vent, to permit make-up air when the kitchen door is closed. This duct system was found open and operational. The kitchen stove and dishwasher are local exhaust-ventilated to outdoors, and were found operational.
- The Caretaker, nor others at the facility have periodic HVAC inspection/service responsibility, and could not provide service records for review. No annual HVAC service records were available on-site, and the HVAC servicer, assigned at Pikesville Unit “Garage 13” is not readily accessible.

LIGHTING: The average illuminance levels in several areas throughout the facility were below the recommended values. Refer to Section 3.4 of this report for a summary of the lighting measurements.

WATER DAMAGE: The facility was principally free of visible water damage. Water damage was evident in the administrative area outside the NCO office. A strong odor was present on entry to the area. Personnel report the leak is long-standing and has not been satisfactorily repaired. A previous pipe or roof drain leak is evident at ceiling tile in the Batallion Headquarters. This was reportedly repaired. There is water staining in the tectum insulation within a section of the drill hall. The Caretaker reports these conditions were prior corrected, and no further leakage is noticeable.

HOUSEKEEPING: In general housekeeping appears good at the facility. There was no significant dust build-up or unattended housekeeping conditions that can lead to safety hazards, except where noted at the HHC storage room. The supply areas/aisles were readily accessible. Current MSDSs were not found readily accessible on-site for the Caretaker and within readiness center operations.

ERGONOMICS: No inherent ergonomic hazards were noted during the survey.

FMS 7/ATTACHED GARAGE: The FMS 7 operated areas were found clean, and in good condition. No observations were noted regarding visually deficient operating conditions that could lead to health and safety hazards. The unit supervisor was not present at the site for questions.

An air sample for lead was collected for an FMS #7 technician conducting routine vehicle maintenance during the morning and administration in the afternoon. Sample results were reported as less than sample detection limits (< 3.6 $\mu g/m^3$) for the workshift, and substantially less than the OSHA Permissible Exposure Limit, time-weighted average standard of 40 $\mu g/m^3$ over a 10-hour work shift.

Refer to the subsequent Section 3.0 for details of all sampling conducted in the FMS 7 areas. Refer to Appendix B – Indoor Air Quality & Ventilation Sample Location Map for sample locations.

A copy of IES' field notes from this assessment is included in a separate document entitled, "Hagerstown_RC_08_Field_Notes." Please also refer to the determination of the Risk Assessment Code (RAC) for occupational exposures, included in the separate document entitled, "Hagerstown_RC_08_Recommendations."

3.0 SAMPLE RESULTS AND MEASUREMENTS

3.1 Air Sampling

3.1.1 Indoor Air Quality

Measurements of air temperature, relative humidity, and CO_2 and CO concentrations were made using a calibrated direct reading hand-held TSI Q-Trak Indoor Air Quality instrument. The carbon monoxide sample results were compared with the Threshold Limit Values (TLVs) for exposure assessment purposes. TLVs are established by the American Conference of Governmental Industrial Hygienists (ACGIH) and are published annually in ACGIH's *TLVs and BEIs*. They refer to airborne exposure concentrations and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. However, because of wide variations in individual susceptibility, a small percentage of workers may experience discomfort from or be affected by some substances at concentrations below the recommended threshold limit.(1)

Refer to Table 1 for details of measured air temperature, relative humidity, CO_2, and CO collected throughout the building during the assessment. Refer to Appendix B - Indoor Air Quality Sample Location Map for the IAQ measurement locations throughout the facility.

TABLE 1 –
AIR TEMPERATURE, RELATIVE HUMIDITY, CO_2, AND CO MEASUREMENTS

Location: Hagerstown National Guard RC, Hagerstown, Maryland
Date: July 17, 2008

Sample Location ID	Sample Location/Description	Approximate Sample Time	CO_2* (ppm)	CO (ppm)	Temperature (°F)	Relative Humidity (%RH)
Q1	Orderly Room, central	0914	657	0.9	69	49
Q2	File Area, outside NCO Office, central	0920	608	0.3	71	48
Q3	Lounge, central	0925	591	0.5	74	61
Q4	Room 140, central	0930	673	1.1	75	52
Q5	Hallway at Distance Learning Center	0935	602	0.5	74	50
Q6	Large Classroom, central (following high occupancy)	0940	875	1.3	72	55
Q7	Batallion Headquarters, central	0945	577	0.8	73	50
Q8	Women's Locker Room, central	0950	564	0.0	77	68
Q9 (a)	Kitchen, central	0955	645	1.7	83	58
Q9 (b)	Kitchen, freezer/storage area	0957	636	0.3	87	50
Q10	Drill Room, central	1025	680	1.0	76	51
Q11	MP Supply Office, central	1030	1250	1.9	79	53
Q12	Men's Locker Room, central	1035	580	0.6	85	41
Q13	Men's Latrine, central	1040	610	0.4	80	43
Q14	Dispatch Office/Storage, central	1045	560	0.3	78	43
Q15	MP Lower Level Storage, central (bay door open)	1050	532	0.8	80	50
Q16	MP Supply Room, central	1055	560	0.9	81	48

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Sample Location ID	Sample Location/Description	Approximate Sample Time	CO_2* (ppm)	CO (ppm)	Temperature (°F)	Relative Humidity (%RH)
Q17	HHC Lower Level Storage, central (heater bleed-thru)	1110	546	0.7	82	53
Q18	HHC Supply Office, central	1115	583	0.7	83	48
Q19	Caretaker's Storage, central	1125	681	0.7	81	43
Q20	Boiler Room, central	1135	586	0.8	83	55
Q21	S-4 Room, central	1145	502	0.0	69	52
Q22	FMS 7 Office, central	1155	696	1.5	75	39
Q23	FMS 7 Shop, Break Room, central (during occupancy)	1200	1130	1.6	77	40
QOUT	Outdoors, Maintenance Bay parking lot	1205	365	0.0	89	57
Q Roof	Outdoors, Roof area	1305	532	1.5	106	26
Q Roof	Outdoors, Roof area	1310	535	0.0	101	29
Q24	Fitness Center, central	1400	528	0.1	76	59
Q25	Computer/IT Office/Storage	1405	533	0.1	73	37
Q26	SPT OPS Office (Recruiter Office), central	1410	556	0.7	71	49

Notes: All areas with CO_2 readings exceeding 650 occupied prior to measurement.
* CO_2 levels exceeding 700 ppm indicate occupancy. Higher levels identified may indicate inadequate air exchange.
** Radiant heat from roof likely reduce %RH in survey area. *** %RH levels > 60% may contribute to bioaerosol growth.

TABLE FOOTNOTES

Measurement device: All measurements collected in real-time using a TSI Q-Trak indoor air quality monitor, at approximately 4 feet above ground/floor height.

ppm Parts per million contaminant in air. All CO_2 and CO concentrations expressed in ppm.

Exposure Guidelines

CO_2 Indoor CO_2 concentrations should be maintained at less than 700 ppm above outdoor air levels – (ASHRAE 62.1-2004)[(2)]

CO 50 ppm (OSHA PEL-TWA); 25 ppm (ACGIH TLV-TWA)

Temperature 68 ºF to 79 ºF (ASHRAE 55-2004)[(3)]

Relative Humidity (%RH) 30% to 60% (TG 277)[(4)]

3.1.2 Airborne Lead Sampling

Air sampling and analysis for lead were conducted with reference to the National Institute for Occupational Safety and Health (NIOSH) Method 7903 – Elements, by Ion Chromatography (IC).

Air samples were collected using constant flow, personal air sampling pumps on 0.8 µm mixed cellulose ester (MCE) membrane filters, in two-piece cassettes. All sampling pumps were calibrated before and after the sampling period with media in-line, using a primary gas flow standard per method requirements. Following the survey, the air samples and a field blanks were collected and shipped via overnight courier to AMA Analytical Services, Inc (AMA) in Lanham, Maryland, which is accredited by the American Industrial Hygiene Association (AIHA) for lead analysis. All air sample results were reported in micrograms of lead cubic meters of air sample ($\mu g/m^3$) for comparison with applicable standards of this assessment.

A summary of analysis results are subsequently presented in Table 2.

Refer to Appendix C for the AMA Analytical Services Inc. Laboratory Analysis Report. Worksite Sampling Data Records are included in a separate document entitled, "Hagerstown_RC_08_Medical."

TABLE 2 –
AIRBORNE LEAD SAMPLING RESULTS SUMMARY

Location: Hagerstown National Guard RC, Hagerstown, Maryland
Date: July 17, 2008

Sample ID	Equipment ID	Sample Description	Start Time	End Time	Sample Time (Minutes)	Avg. Flow Rate (lpm)	Air Volume (L)	Lead Sample Result ($\mu g/m^3$)
H-01	IES-105	[redacted] 2LT Conducting routine administrative activities	08:30 13:50	12:00 15:52	332	1.97	654	< 4.6
H-04	BFE-1272-96	[redacted] SSG Conducting routine administrative activities	08:33 13:16	12:00 16:35	406	1.95	792	< 3.8
H-03	IES-112	[redacted] Conducting vehicle maintenance (no dust) in a m., conducting admin. tasks in p m.	08:40	15:41	421	1.98	833	< 3.6

TABLE FOOTNOTES

Measurement device: MSA ELF Escort constant flow air sampling pump, with 37mm, 0.8-µm MCE filter media

Mg/m3 Milligrams per cubic meter air. Sample results expressed in milligrams contaminant per cubic meter of air.

Occupational Exposure Limits OSHA Permissible Exposure Limit, 8-hour time-weighted average (PEL-TWA) = 0.05 mg/m^3; OSHA Action Limit-TWA = 0.03 mg/m^3
NOTE: Due to workshift duration of 10 hours, all sample results must be interpreted in relation to an adjusted OSHA PEL-TWA of 40 µg/m^3.
Refer to the OSHA Lead Standard at 29 CFR 1910.1025 for details of the OSHA compliance requirements.
ACGIH TLV-TWA= 0.05 mg/m^3

3.2 Lead Dust Sampling

IES performed wipe sampling throughout facility areas of the readiness center and FMS 7. 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 (Environmental Express). The wipe samples collected as a part of this assessment, along with appropriate field blanks, were shipped to AMA for analysis and were analyzed using the NIOSH 7082 flame atomic absorption spectrophotometer (FAAS) method. All wipe sample results were reported in micrograms of lead per square foot of surface sampled (µg/ft^2) for the purposes of this assessment, and for subsequent comparison with OSHA and ARNG Region North IH Office guideline criteria of 200 µg/ft^2.

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A summary of analysis results are subsequently presented in Table 3 below. Refer to Appendix C for the AMA Analytical Services Inc. Laboratory Analysis Report, detailing wipe sampling results. Worksite Sampling Data Records are included in a separate document entitled, "Hagerstown_RC_08_Medical."

TABLE 3 – WIPE/BULK SAMPLE RESULTS SUMMARY

Location: Hagerstown National Guard RC (Edgar Boyd Armory), Hagerstown, Maryland
Date: July 17, 2008

Sample ID	Location	Surface Area Sampled	Lead Surface Concentration (µg/ft^2)
HW-01	Roof, Computer/IT Center HVAC, return-filter compartment, settled dust	100 cm^2	200
HW-02	Roof, Large Classroom HVAC, return-filter compartment, settled dust	100 cm^2	150
HW-03	Roof, Battalion Headquarters, return-filter compartment, settled dust	100 cm^2	590
HW-04	Kitchen, Freezer Storage, top of storage cabinet, settled dust	100 cm^2	< 110
HW-05	Drill Floor/Assembly Hall, emergency exit light & basketball crank, settled dust (composite)	100 cm^2	180
HW-06	Men's Locker Room, tops of lockers, settled dust (composite)	100 cm^2	< 110
HW-07	Orderly Room, supply vents, (surface composite)	100 cm^2	< 110
HW-08	S-3 Office, supply vents, (surface composite)	100 cm^2	< 110
HW-09	Battalion Headquarters, supply vents, (surface composite)	100 cm^2	< 110
HW-10	Battalion Headquarters, return vents, (surface composite)	100 cm^2	130
HW-11	Hallway outside Recruiter's Office, top of display case, settled dust (composite)	100 cm^2	< 110
HW-12	Fitness Center, top of emergency light, settled dust	100 cm^2	< 110
HW-13	Maintenance Bay – Shop Break Room, top of storage cabinet, settled dust	100 cm^2	< 110
HW-14	HHC Supply Room, outside Office, top of cage, settled dust	100 cm^2	480
HW-15	HHC Lower Level Supply Area, Top of Cagework, abandoned ductwork interior (dust); This area is part of the converted indoor firing range (IFR)	100 cm^2	11,000
HW-16	HHC Lower Level Supply Area, Top of cagework, fan-heater casing, (surface dust); This area is part of the converted IFR	100 cm^2	220
HW-17	Boiler Room, Overhead abandoned ductwork, interior (dust); This area is part of the converted IFR	100 cm^2	23,000

TABLE FOOTNOTES

Collection procedure: Wipe sample collected with nitrile glove donned on hand, using "Ghost Wipe" towlette, by sequential wipe using template or best estimate of 100 cm^2 area; multiple passes with clean surface of wipe and subsequent folding, and placement to a labeled, sealed plastic vial or bag.

µg/ft2: Micrograms lead per square foot. Note: laboratory converts result from µg/100 cm^2 to µg/ft^2, prior to reporting.

< 1% Pb Less than 1% lead detected in sample results.

OSHA guideline standard for surface contamination by lead The USDOL/OSHA does not have a promulgated standard for lead surface contamination; however, OSHA has provided an interpretive level of 200 µg/ft^2 to assess the housekeeping requirement of "as free as reasonably practicable". This interpretation is presented in OSHA Industrial Hygiene Technical Manual (TED 01-00-0150; 1/20/1999), and in a letter of interpretation dated 01/13/2003, and subsequently issued into public domain.

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3.3 Bulk Asbestos Sampling

Ceiling plaster collected from the Women's restroom ceiling was submitted for analysis by AMA Analytical Services, a laboratory participating in the National Voluntary Laboratory Accreditation Program. Sample analysis was performed by polarized light microscopy according to USEPA method EPA/600R-93/116, with results reported as "No Asbestos Detected". Further sampling may be advised wherever major renovation or repair is completed, since plaster composition may vary depending on batch materials used.

A summary of analysis results are subsequently presented at Table 4 – Asbestos Bulk Sampling Results Summary.

Refer to Appendix C for the AMA Analytical Services Inc. Laboratory Analysis Report, detailing asbestos bulk sampling results.

TABLE 4 – ASBESTOS BULK SAMPLING RESULTS SUMMARY

Location: Hagerstown National Guard RC, Hagerstown, Maryland
Date: July 17, 2008

Sample Number	Sample Location	Sample characteristic	Result (% Asbestos)
ARNG-HG-B01	Drill Room @ HHC Supply room entry, flooring material	Flooring chip	NAD *

* "NAD" No asbestos detected via polarized light microscopy – Analysis Method EPQ/600/R-93/116 dated Jul 1993.

3.4 Illuminance Survey

The illumination survey was performed pursuant to best Industrial Hygiene practices and the guidelines found in the ARNG document entitled, "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," dated November 17, 2007[(5)]; ANSI/IES documents entitled, "Office Lighting", RP-1-04, 2004 [(6)] and "Industrial Lighting", RP-7-01, 2001[(7)]; and the Illuminating Engineering Society of North America Lighting Handbook, 9th Ed 2000[(8)]. 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 5. 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 D for sample locations.

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TABLE 5 – ILLUMINANCE READINGS SUMMARY

Location: Hagerstown National Guard RC, Hagerstown, Maryland
Date: July 17, 2008

Sample ID	Sample Description	Average Illuminance Measurements (fc)	ARNG Recommended Illuminance Value (fc)
I1	**Orderly Room** (Administrative Office Block), central, on table	60	30-50
I2	**S-3 Office**, adjacent to NCO Office, central, table height	26	30-50
I3	**Administrative Area**, outside NCO Office, central, height	11	30-50
I4	**Room 140,** central, table height	61	30-50
I5	**Aisleway/Corridor,** outside large classroom	5	5
I6	**Large Classroom**, central, table height	23	30-50
I7	**Battalion Headquarters**, central, table height	27	30
I8	**Women's Locker Room**, central	48	7
I9	**Kitchen**, central, table height	51	50
I10	**Drill Hall/Assembly Floor**, central	35	10
I11	**Drill Hall/Assembly Floor**, central (separate location)	24	10
I12	**Men's Locker Room**, central	19	7
I13	**Men's Latrine**, central	33	5
I14	**Old Dispatch Office**, central, table height	19	10
I15	**HHC Supply Office**, central, table height	40	30-50
I16	**S-4 Office**, across from Fitness Center, central, table height	66	30-50
I17	**FMS 7 Office**, central, table height	11	30-50
I18	**FMS 7 Shop Break-room**, central, table height	12	10
I19	**Fitness Center**, central	3	30
I20	**ITC Office (storage)**, central, table height	20	30
I21	**Recruiters Office**, central, table height	16	30

Notes: All illuminance measurements and recommended values are expressed in foot candles (fc)

4.0 EQUIPMENT AND CALIBRATION DATA

4.1 Sampling Equipment List

Table 6 lists the sampling equipment that was used as a part of the assessment.

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TABLE 6 – SAMPLING EQUIPMENT LIST

Equipment Type	Make/Model	Equipment/Serial Number	Equipment Identification
Personal Sampling Pump	MSA Escort ELF	IES-105	IES-105
Personal Sampling Pump	MSA Escort ELF	BFE-1272-96	IES-BFE-1272-96
Personal Sampling Pump	MSA Escort ELF	IES-112	IES-112
Bios Dry Cal Calibrator	Bios DCL-MH	101784	101784
Light Meter	International Light, IL1400A, illum. probe	3206/1782	R2373/3691
Indoor Air Quality Monitor	TSI Model 8554 Q-Trak	02071015	R10120
Velocity Meter	TSI VelociCheck, 8340	00100195	00100195

4.2 Sampling Equipment Calibration Data

Table 7 details the calibration data for each piece of sampling equipment used during the assessment.

TABLE 7 – 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)
IES-105	101784	7/16/08	2.02	7/16/08	1.96	1.99
IES-BFE-1272-96	101784	7/16/08	1.98	7/16/08	1.96	1.97
IES-112	101784	7/16/08	2.01	7/16/08	1.96	1.98

5.0 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, 2007.
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. Technical Guide 277, "Army Facilities Management Information Document on Mold Remediation"
5. "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," ARNG, 17 November 2007.
6. Office Lighting, ANSI/IES RP-1-04, 2004 (Pg. #'s 61 – 63).
7. Industrial Lighting, ANSI/IES RP-7-01, 2001. (Pg. #'s 3 – 5 and 51 – 63)
8. Lighting Handbook, Illuminating Engineering Society of North America, 9th Ed 2000 (Chapter 10, Interior plates1, 5, and 6 and page 20-13)

APPENDIX A

READINESS CENTER PHOTOGRAPHS

Photograph #1 – RC Drill Hall

Photograph #2 – Drill Hall, Tectum Ceiling Material, apparent water staining

Photograph #3 – Roof-mounted Package HVAC unit, intake area

Photograph #4 – Roof-mounted Package HVAC unit, intake area, pooled water

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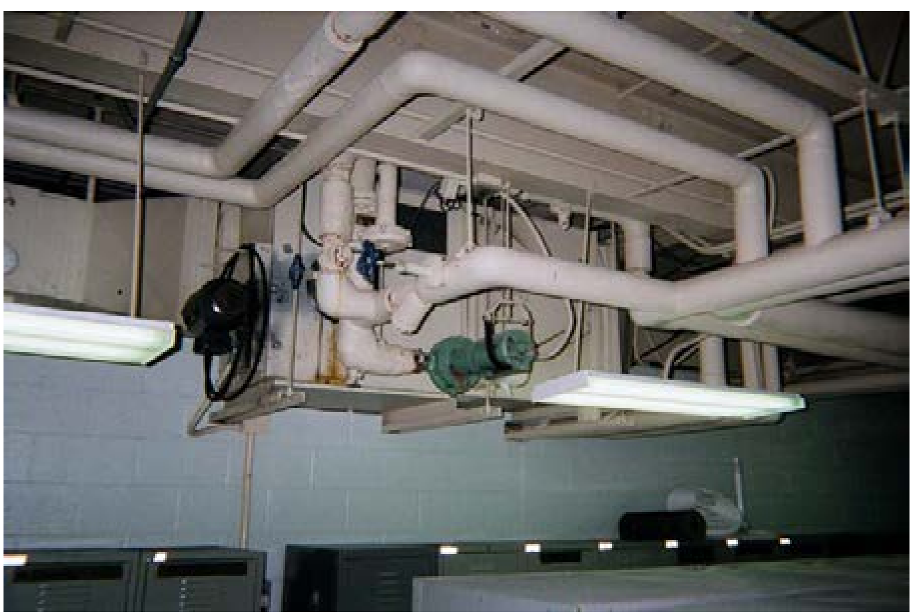
Photograph #5 – Roof, View of package HVAC units



Photograph #6 – Men's Locker Room, HVAC unit at ceiling

Photograph #7 – HHC Lower Level Supply Storage, questionable equipment in storage

Photography #8 – Military Police Area Vault, questionable materials stored in vault

Photograph #9 – HHC Lower Level Storage – Abandoned duct from old firing range
(rear wall of photo)

Photograph #10 – Boiler Room – Abandoned duct from old firing range
(currently separated from HHC Lower Level Storage by block wall)

Photograph #11 – Administrative Area outside NCO Office, continuing water leak

Photograph #12 – Caretaker's Office, Washing Machine

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APPENDIX B

INDOOR AIR QUALITY MAP

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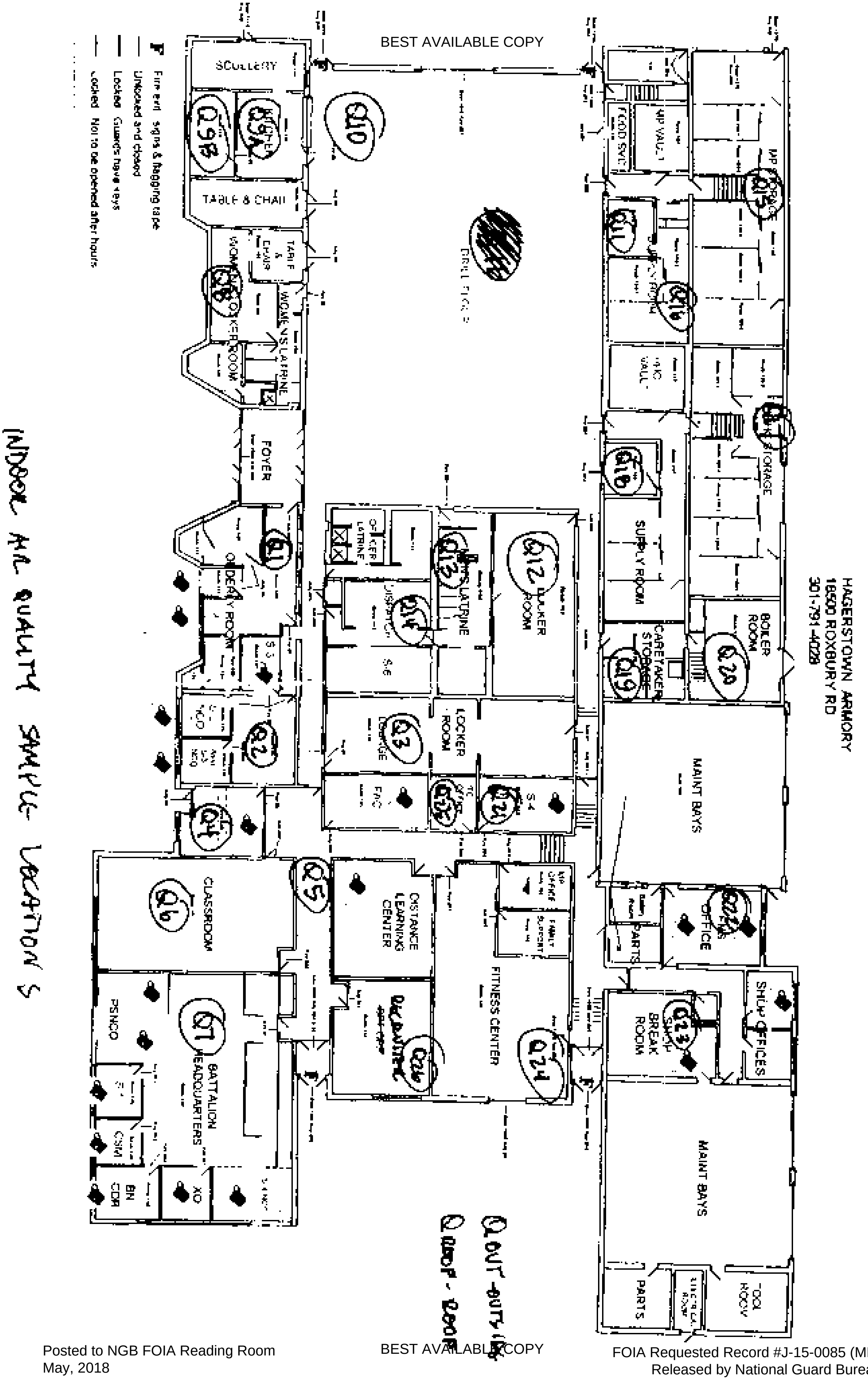

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APPENDIX C

LABORATORY ANALYSIS RESULTS

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	NATL Guard Bureau	**Chain Of Custody:**	503005
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	7/29/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EHS 08794.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	8/5/2008
				Report Date:	8/8/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0873873	H-01	Flame	Air	654	N/A	4.59	ug/m³	<	4.6	ug/m³	
0873874	H-03	Flame	Air	833	N/A	3.60	ug/m³	<	3.6	ug/m³	
0873875	H-04	Flame	Air	792	N/A	3.79	ug/m³	<	3.8	ug/m³	
0873876	H-02	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	
0873877	HW-01	Flame	Wipe	****	0.108	111.52	ug/ft²		200	ug/ft²	
0873878	HW-02	Flame	Wipe	****	0.108	111.52	ug/ft²		150	ug/ft²	
0873879	HW-03	Flame	Wipe	****	0.108	111.52	ug/ft²		590	ug/ft²	
0873880	HW-04	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873881	HW-05	Flame	Wipe	****	0.108	111.52	ug/ft²		180	ug/ft²	
0873882	HW-06	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873883	HW-07	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873884	HW-08	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873885	HW-09	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873886	HW-10	Flame	Wipe	****	0.108	111.52	ug/ft²		130	ug/ft²	
0873887	HW-11	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873888	HW-12	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0873889	HW-13	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	NATL Guard Bureau	**Chain Of Custody:**	503005
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	7/29/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EHS 08794.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	8/5/2008
				Report Date:	8/8/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result		Comments
0873890	HW-14	Flame	Wipe	****	0.108	37.17	ug/ft²	480	ug/ft²	Microvac samples collected on MCE 37mm air filter
0873891	HW-15	Flame	Wipe	****	0.108	37.17	ug/ft²	11000	ug/ft²	Microvac samples collected on MCE 37mm air filter
0873892	HW-16	Flame	Wipe	****	0.108	37.17	ug/ft²	220	ug/ft²	Microvac samples collected on MCE 37mm air filter
0873893	HW-17	Flame	Wipe	****	0.108	37.17	ug/ft²	23000	ug/ft²	Microvac samples collected on MCE 37mm air filter

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

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

Analyst: Melissa Sampson

Technical Manager: G Edward Carney

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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 Re[illegible] Number F[illegible] **503005**

DRAFT 1 OF 3

BILL THE NATIONAL GUARD BUREAU REGION NORTH IH OFFICE DIRECTLY.

Mailing/Billing Information:
1. Client Name: IES ENGINEERS
2. Address 1: 1720 WALTON RD
3. Address 2: BLUE BELL PA 19422
4. Address 3:
5. Phone #: Fax #:

Submittal Information:
1. Job Name: NATL GUARD BUREAU
2. Job Location:
3. Job #: EHS 08794.02 P.O. #:
4. Contact Perso[redacted] @ phone # 610 828-3078
5. Submitted by: [redacted]

Reporting Information (Results will be provided as soon as technically feasible): [redacted] INEERS

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

NORMAL BUSINESS HOURS
- ☐ Immediate
- ☐ Next Day
- ☐ 2 Day
- ☐ ~~3 Day~~
- ☑ 5 Day
- Date Due: 08/05/08
- ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
- ☑ Include COC/Field Data Sheets with Report
- ☐ Email: [redacted] @ iesengineers.com
- ☐ Fax:
- ☐ Verbals:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity___ in a 25mm 37mm
- ☐ NIOSH 7400 ___ (QTY)
- ☐ Fiberglass ___ (QTY)

TEM Air – Please Indicate Filter Type:
PC MCE Porosity___ in a 25mm 37mm
- ☐ AHERA ___ (QTY)
- ☐ NIOSH 7402 ___ (QTY)
- ☐ Other (specify___) ___ (QTY)

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

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

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

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

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

Lead Analysis
- ☐ Paint Chip ___ (QTY)
- ☒ Dust Wipe (wipe type ___) 17 ___ (QTY)
- ☒ Air 34 (QTY)
- ☐ Soil/Solid ___ (QTY)
- ☐ TCLP ___ (QTY)
- ☐ Drinking Water ___ (QTY)
- ☐ Waste Water ___ (QTY)
- ☐ Dust Wipe Furnace (wipe type ___) ___ (QTY)

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

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
H-01	Edie	7/17/08	654	/				✓		✓						
H-03	Horchner		833	/				✓		✓						
H-04	Pressway		792	/				✓		✓						
H-02	Field Blank	↓														

CLIENT CONTACT
(LABORATORY STAFF ONLY)

Date/Time: 8/1/08 Contact: TD By: MS
left VM for Wipe areas and volumes

Date/Time: 8/8/[illegible] Contact: By:
14:30 TH Derr
HW14→17 are microvac samples – 100 cm²

Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 7/29/08 0930 Via: FedEx By (Print): Chris Nicodemus Sign: Chris Nicod[illegible]
2. Date/Time Analyzed: __/__/__ @__ By (Print): Sign:
3. Results Reported To: Via: Date: __/__/__ Time: Initials:
4. Comments:

LAB CONTACT: ERIN K. MEARA/AMA ANALYTICAL SERVICES, INC.

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AMA Analytical Services, Inc.
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www.amalab.com

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Mailing/Billing Information:
1. Client Name: IES ENGINEERS
2. Address 1: 1720 WALTON RD
3. Address 2: BLUE BELL PA 19422
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5. Phone #: Fax #:

Submittal Information:
1. Job Name: NATL GUARD BUREAU
2. Job Location:
3. Job #: EHS 08794.02 P.O. #:
4. Contact Person [redacted] @ phone # 610 828-3078
5. Submitted by [redacted] EERS

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

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ Immediate Date Due: ___ ❑ 24 Hours Time Due: ___ Comments: ___	❑ Immediate ❑ Next Day ❑ 2 Day ❑ 3 Day ❑ 5 Day + Date Due: ___ ❑ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	❑ Include COC/Field Data Sheets with Report ❑ Email: ___ @ ___ ❑ Fax: ___ ❑ Verbals: ___

Asbestos Analysis
PCM Air - Please Indicate Filter Type:
PC MCE Porosity___ in a 25mm 37mm
❑ NIOSH 7400___(QTY)
❑ Fiberglass ___(QTY)
TEM Air - Please Indicate Filter Type:
PC MCE Porosity___ in a 25mm 37mm
❑ AHERA ___(QTY)
❑ NIOSH 7402 ___(QTY)
❑ Other (specify___) ___(QTY)
PLM Bulk
❑ EPA 600 - Visual Estimate___(QTY)
❑ EPA Point Count___(QTY)
❑ NY State Friable 198.1 ___(QTY)
❑ Grav. Reduction ELAP 198.6 ___(QTY)
❑ Other (specify___) ___(QTY)

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

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

Lead Analysis
❑ Paint Chip ___(QTY)
❑ Dust Wipe (wipe type___) ___(QTY)
❑ Air ___(QTY)
❑ Soil/Solid ___(QTY)
❑ TCLP___(QTY)
❑ Drinking Water ___(QTY)
❑ Waste Water ___(QTY)
❑ Dust Wipe Furnace (wipe type ___) ___(QTY)

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

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
HW-01	Roof, HVAC CC	7/17/08														
HW-02	Roof, HVAC CL															
HW-03	Roof, HVAC BH															
HW-04	Kitchen, STORAGE															
HW-05	DR, FES															
HW-06	ML, TL															
HW-07	DR, SV															
HW-08	S-3, SV															
HW-09	BH, SV															
HW-10	BH, RV															
~~HW~~ HW-11	~~BH~~ HALL, REC															

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

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

LAB CONTACT: ERIN K. MEARA/AMA ANALYTICAL SERVICES, INC.

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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) 5C.3005

3/3

BILL THE NATIONAL GUARD BUREAU REGION NORTH IH OFFICE DIRECTLY.

Mailing/Billing Information:
1. Client Name: IES ENGINEERS
2. Address 1: 1720 WALTON RD
3. Address 2: BLUE BELL PA 19422
4. Address 3:
5. Phone #: ____ Fax #:

Submittal Information:
1. Job Name: NATL GUARD BUREAU
2. Job Location:
3. Job #: [redacted] P.O. #
4. Contact Person: [redacted] 610 828-3078
5. Submitted by: [redacted]NEERS

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

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

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

REPORT TO:
❑ Include COC/Field Data Sheets with Report
❑ Email: ____ @ ____
❑ Fax:
❑ Verbals:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
❑ NIOSH 7400 ____ (QTY)
❑ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
❑ AHERA ____ (QTY)
❑ NIOSH 7402 ____ (QTY)
❑ Other (specify ____) ____ (QTY)
PLM Bulk ARNG-HG-B01 only
☑ EPA 600 – Visual Estimate ____ (QTY)
❑ EPA Point Count ____ (QTY)
❑ NY State Friable 198.1 ____ (QTY)
❑ Grav. Reduction ELAP 198.6 ____ (QTY)
❑ Other (specify ____) ____ (QTY)

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

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

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

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

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
HW-12	FC, TL	7/17/08														
HW-13	MS, BR															
HW-14	SR, TC			100cm²		microvacuum				dP						
HW-15	LSS, TC, AD															
HW-16	LSS, FHC															
HW-17	BR, AD															
~~HW-18~~																
~~HW-19~~																
ARNG-HG-B01	Drill Hall Floor						✓				✓					

CLIENT CONTACT
(LABORATORY STAFF ONLY)

Date/Time: ____ Contact: ____ By: ____

Date/Time: ____ Contact: ____ By: ____

Date/Time: ____ Contact: ____ By: ____

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

LAB CONTACT: ERIN K. MEARA/AMA ANALYTICAL SERVICES, INC.

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

NVLAP® 101143-0

CERTIFICATE OF ANALYSIS

Client: National Guard Bureau

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

Job Name: NATL Guard Bureau

Job Location: Not Provided

Job Number: EHS 08794.02

P.O. Number: Not Provided

Chain Of Custody: 503005

Date Analyzed: 8/5/2008

Person Submitting: Non-Responsive [redacted]

Attention: Non-Responsive [redacted]

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Color	Homogeneity	Analyst ID	Comments
0873894	ARNG-HG-B01	NAD	--	--	--	--	--	--	TR	--	--	100	Beige	Homogeneous	LBP	

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

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

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

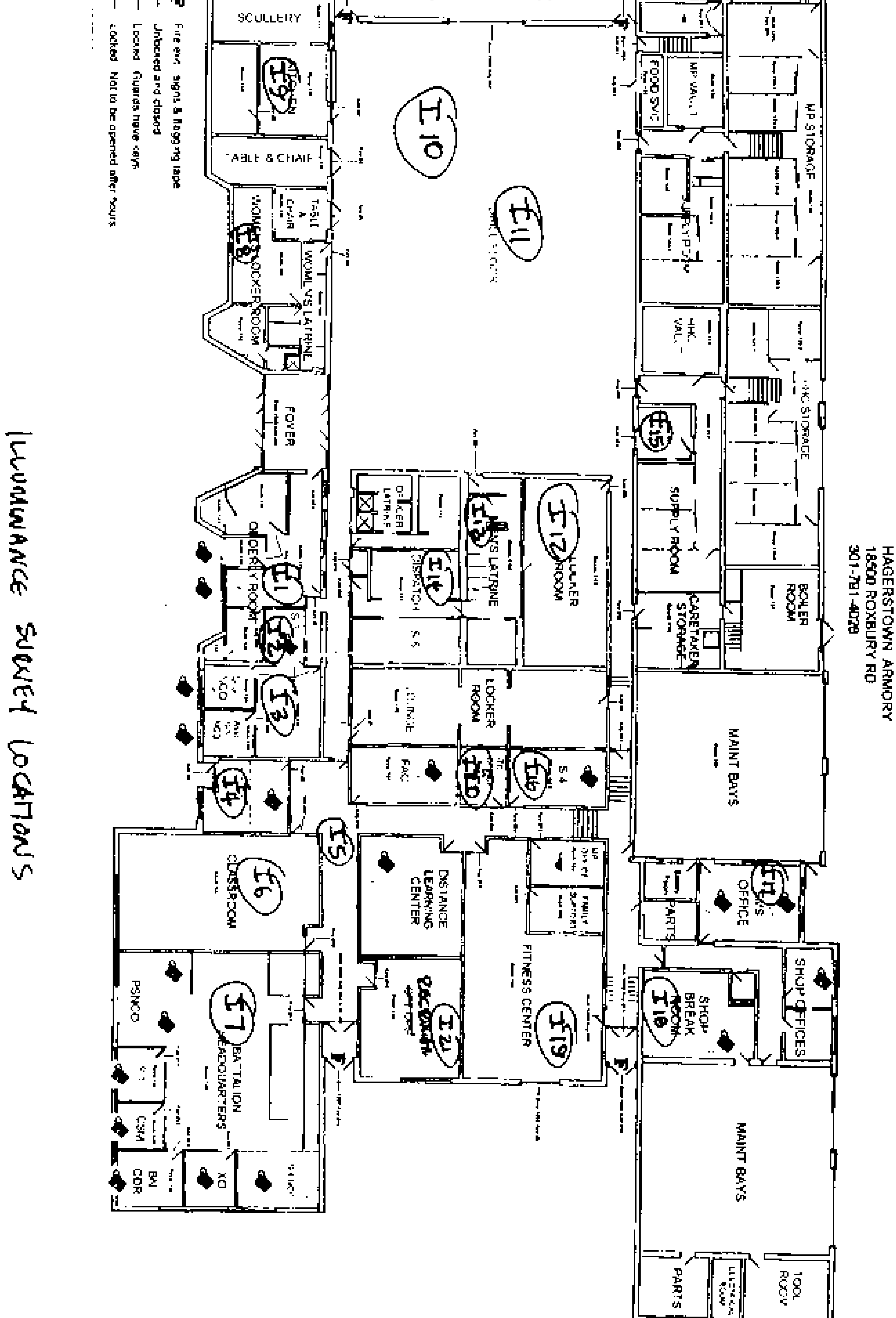
Uncertainty: For samples containing asbestos in range of 1-10% the CV is 0.43, 11-35% CV=0.55, >35 CV=0.23

Lom Butruk

Lom Butruk

APPENDIX D

ILLUMINANCE READING MAP



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National Guard Region North

National Guard Readiness Center
Industrial Hygiene Evaluation
Hagerstown Army National Guard Armory
Hagerstown, MD 21740-9538

Prepared for:

National Guard Region North
Industrial Hygiene Office
301 Old Bay Lane
Havre De Grace, MD 21078

Attn: Non-Responsive [redacted]

Prepared by:

Bonus Environmental, LLC
P.O. Box 121
Mt. Pleasant, Michigan 48804

Project No. 1061-03
August 4, 2010

Bonus Environmental, LLC

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APPENDICES

BONUS ENVIRONMENTAL

August 4, 2010
Project No. 1061-03

National Guard Region North
Industrial Hygiene Office
301 Old Bay Lane
Havre De Grace, MD 21078-4003

Attn: [redacted]

Project: Army National Guard Readiness Center, Industrial Hygiene Evaluation
Hagerstown 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 Hagerstown Army National Guard Readiness Center located at 18500 Roxbury Road in Hagerstown, 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 Jeff Walworth on May 19, 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 Hagerstown Readiness Center is an Army National Guard armory comprised of offices, a drill hall, a kitchen, a former indoor firing range, an attached maintenance garage, a fitness room, supply rooms, a boiler room, a battery room, locker rooms, classrooms, a break room, and a lounge. The point of contact for this facility was MSG Curtis Shank. Nine (9) full-time administrative personnel and five (5) full-time maintenance personnel are employed in the approximately 31,800 ft² facility. A shop diagram depicting the locations of the operations identified during this industrial hygiene evaluation is attached to this report as Appendix A.

The National Guard Bureau Region North Industrial Hygiene Office provided governmental furnished equipment and sampling media required to perform the industrial hygiene evaluation. Chain of custody forms for laboratories approved by the National Guard Bureau Region North Industrial Hygiene Office were provided with the sampling media. All samples collected during this industrial hygiene evaluation were sent to the National Guard Bureau Region North Industrial Hygiene Office approved laboratories for analysis.

2.0 – LEAD SAMPLING

2.1 – Lead Wipe Sampling

Lead wipe sampling was performed according to the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame). Twenty (20) wipe samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. The National Guard Bureau Region North Industrial Hygiene Office has established/interpreted a threshold of 200 µg/ft² of lead concentration for surface cleanliness. The following table outlines the locations and analytical results for the lead wipe samples collected during this project:

Army National Guard - Hagerstown Readiness Center Lead Wipe Sample Results				
Sample #	*Sample Date*	*Sample Location*	*Sample Area (ft^2)*	*Sample Result ($\mu g/ft^2$)*
H-W-1	5-19-10	Field Blank	---	< 12
H-W-2	5-19-10	Drill hall, NE corner, top of basketball hoop lifting device	0.111	< 110
H-W-3	5-19-10	Drill hall, NW corner, top of locker #25	0.111	260
H-W-4	5-19-10	Drill hall, SW corner, top of file cabinet	0.111	< 110
H-W-5	5-19-10	Drill hall, floor, east side "free throw" line	0.111	< 110
H-W-6	5-19-10	Drill hall, floor, west side "free throw" line	0.111	< 110
H-W-7	5-19-10	West LRS supply storage (former indoor firing range), floor	0.111	< 110
H-W-8	5-19-10	West LRS supply storage (former indoor firing range), overhead heater	0.111	10,000
H-W-9	5-19-10	West LRS supply storage (former indoor firing range), NE corner, light fixture	0.111	< 110
H-W-10	5-19-10	West LRS supply storage (former indoor firing range), NE corner, ventilation duct grill	0.111	< 110
H-W-11	5-19-10	West LRS supply storage (former indoor firing range), top of inflatable raft stored on top of cage	0.111	< 110
H-W-12	5-19-10	Supply office (outside of former indoor firing range), on top of television	0.111	< 110
H-W-13	5-19-10	Kitchen, top of mixing machine	0.111	< 110
H-W-14	5-19-10	Recruiting office, east side, top of bookshelf	0.111	< 110
H-W-15	5-19-10	Classroom 141, east side-center of room, surface of desk	0.111	< 110
H-W-16	5-19-10	Room S-3, NW corner, top of file cabinet	0.111	< 110

Army National Guard - Hagerstown Readiness Center ***Lead Wipe Sample Results***				
Sample #	***Sample Date***	***Sample Location***	***Sample Area (ft^2)***	***Sample Result ($\mu g/ft^2$)***
H-W-17	5-19-10	Room 156, fitness center, top of DVD player	0.111	< 110
H-W-18	5-19-10	East maintenance garage, along south wall, surface of workbench	0.111	130
H-W-19	5-19-10	Shop break room, along west wall, top of printer	0.111	< 110
H-W-20	5-19-10	Battery room, top surface of ventilation hood	0.111	180
H-W-21	5-19-10	West maintenance garage, center of room, top of toolbox	0.111	< 110

Surface cleanliness threshold = < 200 $\mu g/ft^2$

2.2 – Lead Air Sampling

The purpose of lead air monitoring was to document task-specific activities and corresponding exposures to lead. Occupational Safety and Health Administration (OSHA) 29 CFR 1926.62 requires employers whose employees are exposed to lead in the work place, in any quantity, make a determination whether any employee's exposure exceeds the action level (AL) of 30 $\mu g/m^3$ or the maximum permissible exposure limit (PEL) of 50 $\mu g/m^3$ as 8-hour time weighted averages (TWAs). If employee exposures are less than 30 $\mu g/m^3$, training is required under the Hazard Communication 29 CFR 1926.59. Exposures that exceed the AL or PEL require the employer to comply with additional requirements, including air monitoring, additional training, and restricted work practices as outlined in OSHA 29 CFR 1926.62.

Representative fixed area sampling was conducted for potential airborne concentrations of lead in accordance with accepted Industrial Hygiene methods recognized by the National Institute for Occupational Safety and Health (NIOSH) and OSHA. Representative breathing zone samples were not collected from an employee performing administrative tasks.

Lead exposure monitoring was performed in accordance with the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame) with SKC personal air sampling pumps calibrated to 2.0 liters per minute. All samples were collected on 37 mm diameter cassettes with mixed-cellulose ester filters. All sampling pumps were calibrated before and after each use to ensure volume accuracy. Two (2) samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. Analytical results of the lead wipe and air samples are attached to this report as Appendix B.

Army National Guard - Hagerstown Readiness Center
Lead Air Sample Results

Sample #	Sample Type	Sample Location	Flow Rate	Start	Stop	Vol.	Reprt. Limit (µg/m³)	Results (µg/m³)	8 hr TWA (µg/m³)
May 19, 2010									
H-A-1	FB	Field Blank	---	---	---	0	3	< 3	N/A
H-A-2	IWA	West maintenance garage, east side bay	2.0	0813	1524	862	3.5	< 3.5	N/A
H-A-3	IWA	Room S-3, MSGT [redacted]s desk	2.0	0820	1527	854	3.5	< 3.5	N/A

PS = Personal sample, **IWA** = Inside work area, **N/A** = Not Applicable
Note: The OSHA PEL of 50 µg/m³ is averaged over an 8 hr work shift

3.0 - PHYSICAL CONDITION OF FACILITY / PERSONNEL CONCERNS

3.1 - Lead Based Paint

During the industrial hygiene evaluation of the Army National Guard Hagerstown Readiness Center, Bonus Environmental, LLC performed a visual inspection of the facility in regards to lead based paint. Bonus Environmental, LLC identified no areas of peeling paint which could potentially pose a lead exposure hazard.

LeadCheck™, ChromateCheck™, NickelCheck™, and CadmiumCheck™ swabs were utilized as a screening method on a horizontal table that has been used during welding activities in the past. Metal-specific swabs were used to test for the presence of cadmium, chromate, lead, and nickel. All swabs gave a negative indication for the given metal contaminant.

3.2 – Presumed Asbestos Containing Materials

During the industrial hygiene evaluation of the Army National Guard Hagerstown Readiness Center, Bonus Environmental, LLC performed a visual inspection to identify presumed asbestos containing materials (PACM) and, if found, to note their condition. Bonus Environmental, LLC did not identify any PACM that was considered to be in poor or damaged condition.

3.3 - Water Damage/Mold Growth

During the industrial hygiene evaluation of the Army National Guard Hagerstown 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 tiles were seen in Battalion Headquarters, Room S-3/153, and in the hallway outside of FMS 7 area.

3.4 - Housekeeping

During the industrial hygiene evaluation of the Army National Guard Hagerstown Readiness Center, Bonus Environmental, LLC performed an evaluation of the housekeeping practices. Bonus Environmental, LLC found the housekeeping to generally be good, with the exception of the west maintenance garage, where numerous cords were laid or stretched across the floor, oil absorbent covered a large area of the floor, and tires were erratically stacked against an emergency eye wash station.

3.5 – Employee Interviews
During the industrial hygiene evaluation of the Army National Guard Hagerstown 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 Hagerstown Readiness Center, Bonus Environmental, LLC measured temperature, relative humidity, carbon monoxide (CO), and carbon dioxide (CO_2) throughout the facility. A calibrated TSI Q-Trak Model 7565 Indoor Air Quality Monitor equipped with a Q-Trak Probe 982 was utilized to record indoor air quality measurements.

Carbon dioxide is a natural component of air and the amount of CO_2 in a given air sample is commonly expressed as parts per million (ppm). The outdoor air in most locations contains about 380 ppm carbon dioxide. Higher outdoor CO_2 concentrations can be found near vehicle traffic areas, industry and sources of combustion. The concentrations of CO_2 found in most offices are well below the OSHA Permissible Exposure Limit (PEL) of 5,000 ppm when averaged over an 8-hour time period for an industrial workplace. While levels below 5,000 ppm are considered to pose no serious health threat, studies have indicated that individuals in offices with elevated CO_2 concentrations tend to report drowsiness, lethargy and a general sense that the air is stale. Ventilation rates for office spaces are defined by various codes and standards. The most widely accepted standard is the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 62. According to ASHRAE Standard 62.1-2007, CO_2 concentrations below 700 ppm above the outdoor level are considered to indicate adequate ventilation and provide human comfort. The CO_2 measurements collected during this industrial hygiene evaluation ranged from 412 ppm to 896 ppm and indicate adequate ventilation within the facility.

Carbon monoxide, also known as the "silent killer," is a colorless, odorless, poisonous gas that results from the incomplete burning of common fuels such as natural or liquefied petroleum gas, oil, wood or coal. When carbon monoxide is inhaled, it enters the blood stream and reduces the ability of the blood to carry oxygen to vital organs, such as the heart and brain. Because it is impossible to see, taste or smell the toxic fumes, CO can harm you before you are aware it is in your work area. At lower levels of exposure, CO causes mild effects that are often mistaken for the flu. These symptoms include headaches, dizziness, disorientation, nausea and fatigue. The effects of CO exposure can vary greatly from person to person depending on age, overall health and the concentration and length of exposure. The OSHA has established a PEL of 50 ppm. OSHA standards prohibit worker exposure to more than 50 parts of the gas per million parts of air averaged during an 8-hour time period. The peak CO level for employees is 200 ppm. The CO measurements collected during this industrial hygiene evaluation ranged from 0.5 ppm to 1.4 ppm. CO levels were well below the OSHA PEL during this industrial hygiene evaluation.

During the industrial hygiene evaluation of the Army National Guard Hagerstown Readiness Center, Bonus Environmental, LLC collected temperature measurements. Temperature measurements throughout the facility ranged from 65.3ºF to 69.1ºF and are considered to be within an acceptable range.

During the industrial hygiene evaluation of the Army National Guard Hagerstown Readiness Center, Bonus Environmental, LLC collected relative humidity measurements. Relative humidity measurements throughout the facility ranged from 49.9% to 61.3% and are considered to be within an acceptable range. Indoor air quality measurements recorded during this industrial hygiene evaluation are summarized in the table below.

Army National Guard - Hagerstown Readiness Center Indoor Air Quality Measurements				
Location	*CO_2 (ppm)*	*CO (ppm)*	*Relative Humidity (%)*	*Temperature (ºF)*
Outdoors, south side entrance	407	2.2	68.8	58.2
Room 109, Kitchen	887	0.5	61.3	65.3
Drill hall, center of room	896	0.7	57.4	67.1
Recruiting office	603	0.6	54.4	67.7
Room 150, men's locker room/lounge	564	0.8	49.9	68.7
Classroom 141	440	1.0	51.2	68.6
Room 156. Fitness center	507	0.5	50.5	69.1
Shop break room	412	0.9	52.5	67.6
Center of west maintenance garage	686	1.4	55.2	66.8
Boiler room	519	1.1	57.5	66.7
East supply room	797	0.9	54.3	67.8

Required/Recommended Values
CO_2 *- OSHA PEL = 5,000 ppm and ASHRAE Standard 62.1-2007 = no greater than 700 ppm above outdoor*
CO *- OSHA PEL = 50 ppm and OSHA Ceiling Limit = 200 ppm*
Temperature *- ASHRAE Standard 55-2004 = between approximately 67 and 82 °F.*
RH *– ANSI/ASHRAE Standard 62.1-2007 = <65%*

4.0 – LIGHTING

Utilizing a properly calibrated Cooke Corporation cal-Light 400 light meter, Bonus Environmental, LLC collected illumination readings throughout the facility. Illumination measurements recorded during this industrial hygiene evaluation are summarized in the table below.

Army National Guard - Hagerstown Readiness Center Lighting Survey			
Location	*Measurement in Foot Candles*	*Requirement in Foot Candles*	*Requirement Met?*
Room S-3 – Office	46.2	50	NO
Center of Battalion Headquarters	88.7	50	YES
Room S-1 XO – Office	82.1	50	YES
Room S-1 NCO – Office	86.4	50	YES
Classroom 141	47.7	30	YES

Army National Guard - Hagerstown Readiness Center Lighting Survey			
Location	*Measurement in Foot Candles*	*Requirement in Foot Candles*	*Requirement Met?*
Family support office	82.8	50	YES
Recruiting office	77.8	50	YES
LRS office	70.7	50	YES
Entrance foyer	37.3	5	YES
Women's latrine	115.3	5	YES
Room 105 – Women's locker room	82.8	7	YES
Room 108 – "tables & chairs" – Storage	25.9	30	NO
Room 109 – Kitchen	110.7	10	YES
Room 110 – Kitchen storage	138.8	30	YES
Drill hall, center of room	29.1	30	NO
Room 151 – Training/FAC	63.4	30	YES
Room 150 – Men's locker room/lounge	28.6	7	YES
Room 113 – Supply	77.9	30	YES
Men's officer latrine/locker room	173.7	7	YES
Men's latrine	64.0	5	YES
Locker room	51.7	7	YES
Room 153/S-4 – Storage	42.6	30	YES
Server/ITC room	47.4	30	YES
Room 157, DLC classroom	40.6	30	YES
Room 156 – Fitness center	25.3	30	NO
Room 154, MP office	69.9	50	YES
Hallway outside of room 159	19.4	5	YES
East maintenance garage, locker room	61.1	7	YES
FMS 7 tool room	15.1	30	NO
Center of east maintenance garage	18.1	75	NO
Shop break room	36.8	10	YES
Room 163, shop office	52.8	50	YES
FMS office/parts storage	89.9	30	YES
Battery room	77.2	30	YES
Center of west maintenance garage	57.6	75	NO
Parts room	160.6	30	YES
Caretaker/Storage room	11.3	30	NO
Boiler room	14.2	30	NO
East Supply room	52.3	30	YES
East Supply office	80.1	50	YES
East LRS storage	13.5	30	NO
West Supply room	127.1	30	YES
West Supply office	42.0	50	NO
West LRS storage	12.2	30	NO
Family support storage	Inaccessible		
Room 155, Family support office	Inaccessible		
Room 164, shop office	Inaccessible		
Vault #1	Inaccessible		
Vault #2	Inaccessible		

Lighting levels were compared to the levels outlined within the ANSI/IESNA RP-1-04 Office Lighting Handbook, and the ANSI/IESI RP-7-01 Lighting Industrial Facilities Handbook. Areas within the facility which did not meet the foot candle requirements are identified with a "NO" within the Requirement Met? column. It is recommended that illumination be improved in all the areas that did not meet the requirements. Improving illumination can be achieved by replacing burned-out lamps/bulbs, cleaning fixtures, relocating detailed work activities to more illuminated areas, and using supplemental task lighting.

5.0 – EVALUATION OF ATTACHED GARAGE

5.1 – Operational Description - Readiness Center

Nine (9) administrative and five (5) maintenance personnel are assigned to the Hagerstown Readiness Center to provide space for units to support and train soldiers. Vehicle maintenance typically occurs during the normal work hours of Monday-Friday, 0630-1700. The attached garages include four bays, all of which include vehicle exhaust ventilation. Personal protective equipment including leather gloves, nitrile gloves, ear plugs, and safety glasses are available to all employees who work within the attached garage. Activities conducted on the day of the IH evaluation included engine and brake repairs.

5.2 – Local Exhaust Ventilation System

Exhaust ventilation systems were identified in the Hagerstown Readiness Center facility during the industrial hygiene evaluation. The ventilation system consisted of a central exhaust fan and series of flexible trunks of ductwork. The central exhaust fan was centrally located and exhausted directly to the outdoors through the ceiling. The exhaust ventilation system was installed for the purpose of removing diesel exhaust fumes. A TSI VelociCalc 9555 Multiparameter Ventilation Monitor was utilized to collect multiple measurements of the face velocity of each flexible trunk of ductwork. The table below details the results of the ventilation system evaluation in the Hagerstown Readiness Center facility.

Army National Guard - Hagerstown Readiness Center Vehicle Exhaust - Ventilation System Evaluation				
Location	*Measured Average Face Velocity (fpm)*	*Calculated Volumetric Flow (cfm)*	*Area of the Opening (ft^2)*	*Sufficient Air Flow*
East garage, north duct	1250	425	0.34	NO
East garage, south duct	1213	412	0.34	NO
West garage, north duct	670	228	0.34	NO
West garage, south duct	652	222	0.34	NO

cfm = cubic feet per minute, calculated by multiplying the measured face velocity by the area of the opening, **fpm** = feet per minute, **calculated reference value** = 1,781 acfm

Figure VS-85-02 on page 13-151 of the ACGIH "A Manual of Recommended Practice for Design, 26th Edition" specifies that tailpipe exhaust ventilation volumes for operating engines connected directly to a tailpipe exhaust system are to be determined by the engine displacement, the engine RPM, and tailpipe exhaust temperature, plus a 20% safety factor. The largest types of vehicles serviced within the Maintenance garages are M925 5-ton cargo trucks equipped with a Cummins NHC-250 14.0 liter diesel engine which operates at 2,100 RPM. Based on an average tailpipe temperature of 300ºF, the minimum required volume flow rate of the overhead exhaust system used to control emissions from the fumes of diesel exhaust was calculated to be 1,781 acfm (actual cubic feet per minute). The representative exhaust duct systems tested in the Hagerstown Readiness Center facility did not provide sufficient air flow.

6.0 – BATTERY ROOM

Mechanics from the Maintenance garages work within the Battery room on an as needed basis. The Battery room is used for storage and charging of batteries. Batteries in need of repair are shipped to another facility. Personal protective equipment including a rubber apron, nitrile gloves, eye goggles, safety shoes, and face shield are available to all employees who work within the Battery room. No work activities were being performed within the Battery room during the industrial hygiene evaluation.

Lead acid batteries produce hydrogen gas and other fumes at 80% recharge point, making proper ventilation in the battery charging area extremely important. Hydrogen gas is not only colorless and odorless, but is lighter than air, causing the gas to rise to the top of a building. For safety purposes, the concentration of hydrogen in the air should be kept below 1% to reduce risk of explosion. An evaluation of the ventilation system within the Battery Shop was performed during this industrial hygiene evaluation of the facility. The Battery Shop is used as a place of storage and charging of lead-acid batteries. Thirty four (34) 6-cell (120 amps-hour capacity) batteries were located in the battery room, with eleven (11) of them on chargers. A vent hood, located on the east side of the room approximately 7' above the floor, provides ventilation to the room. The vent hood has an opening measuring 12"x 12". A TSI VelociCalc 9555 Multiparameter Ventilation Monitor was utilized to measure the face velocity at the ventilation hood. Measurements indicated that the exhaust fan provides an average volumetric flow rate of 367 fpm. The entry door to the Battery Shop is grilled to provide make-up air. The ventilation rate of the exhaust system required within the Battery Shop was calculated with the following formula.

$Q = 0.054 \times I \times N$ where,

- Q = required ventilation rate, cfm
- I = 0.21 x (capacity of largest battery to be charged in amp-hours)
  or 0.25 x (maximum obtainable amps from charger), whichever is greater
- N = number of batteries to be charged at one time x number of cells per battery

In this case, the required ventilation of the exhaust system (Q) within the Battery Shop was determined to be 90 cfm, where I=0.21 x 120, N=11 x 6. The ventilation rate of the exhaust system in place within the Battery Shop was determined to be 367 cfm.

7.0 - CONCLUSION

Bonus Environmental, LLC was contracted by the National Guard Bureau Region North to identify and measure the existence and extent of potentially hazardous operations or conditions at the Hagerstown Army National Guard Readiness Center located at 18500 Roxbury Road in Hagerstown, Maryland. The purpose of this evaluation was to generate or to update a previous baseline evaluation so that employee exposure history can be provided to each civilian and military employee. An industrial hygiene evaluation of the facility was performed by Bonus Environmental, LLC representative [redacted] on May 19, 2010:

Bonus Environmental, LLC recommends that any areas of concerns outlined within this report be evaluated to ensure the necessary actions are made. Following the completion of the industrial hygiene evaluation, Bonus Environmental, LLC found the following safety and/or indoor air quality conditions of the facility to be within acceptable levels/condition in regards to the following:

- Carbon Dioxide
- Carbon Monoxide
- Lead Air Samples
- Ergonomics
- Presumed Asbestos Containing Materials
- Temperature
- Relative Humidity

It has been a pleasure to be of assistance to you. Please contact us if you have any questions concerning this report or if we can be of any further assistance in any other environmental or occupational health matter.

Sincerely,

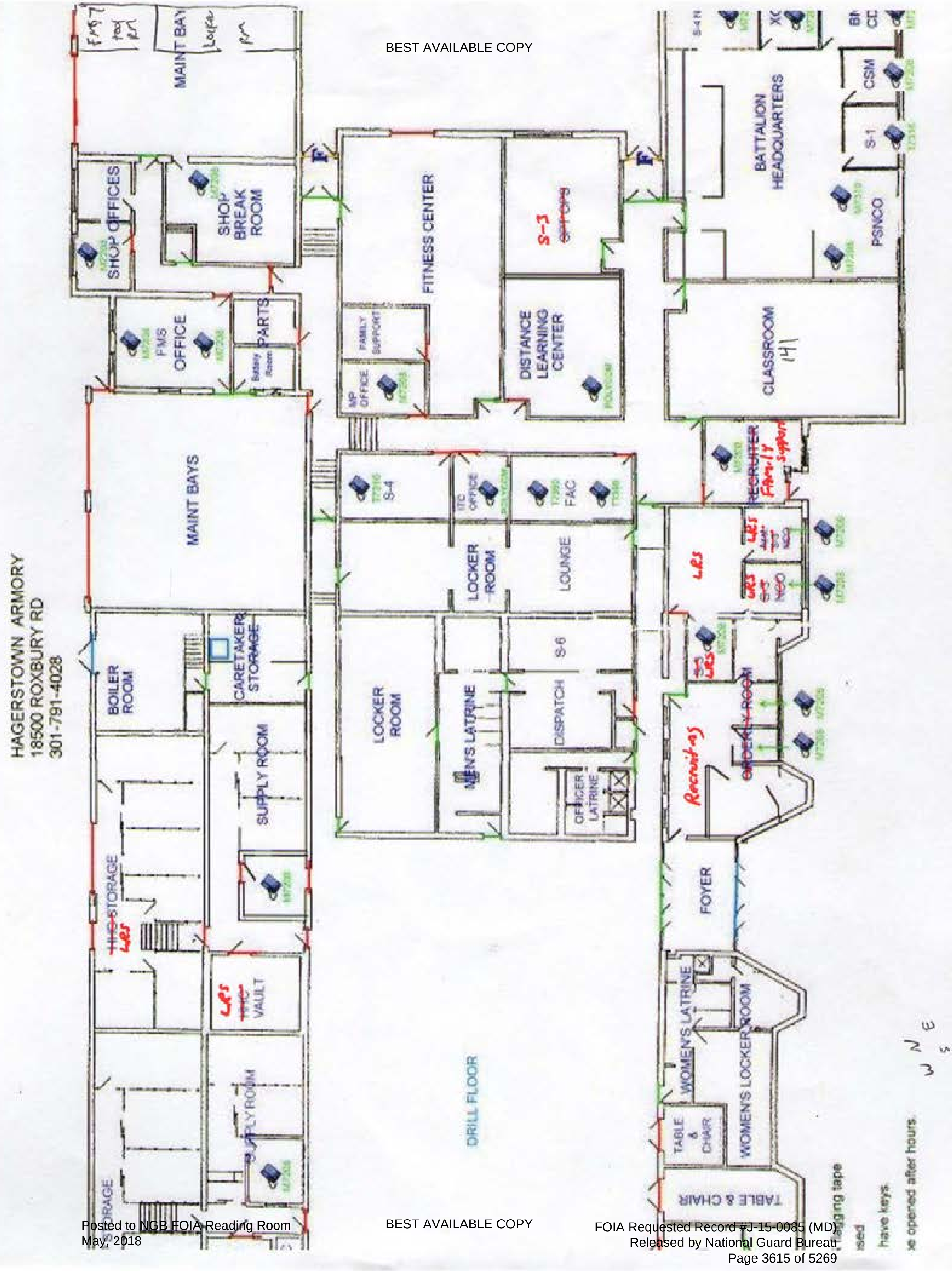
[redacted]
Principal
Bonus Environmental, LLC

[redacted]
Principal
Bonus Environmental, LLC

Bonus Environmental, LLC *P.O. Box 121* *Mt. Pleasant, MI 48804*
Work 989-779-7686 *Fax 989-779-7689* *www.bonusenvironmental.com*

<u>Appendix A</u>

Shop Diagram



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Appendix B

Lead Sample Results

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

RECEIVED JUN 14 2010

AIHA ACCREDITED LABORATORY Environmental Lead See aihaqap.org for details 100470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Hagerstown Armory	**Chain Of Custody:**	507186
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Hagerstown,MD	**Date Submitted:**	5/21/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Hagerstown Armory	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	5/28/2010 **Report Date:** 6/1/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
1047800	H-A-1	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1047801	H-A-2	Flame	Air	862	N/A	3.5	ug/m³	<3	<3.5	ug/m³	
1047802	H-A-3	Flame	Air	854	N/A	3.5	ug/m³	<3	<3.5	ug/m³	
1047803	H-W-1	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
1047804	H-W-2	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047805	H-W-3	Flame	Wipe	****	0.111	110	ug/ft²	29	260	ug/ft²	
1047806	H-W-4	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047807	H-W-5	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047808	H-W-6	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047809	H-W-7	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047810	H-W-8	Flame	Wipe	****	0.111	110	ug/ft²	1100	10000	ug/ft²	
1047811	H-W-9	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047812	H-W-10	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047813	H-W-11	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047814	H-W-12	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047815	H-W-13	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047816	H-W-14	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047817	H-W-15	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047818	H-W-16	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	Hagerstown Armory	**Chain Of Custody:**	507186
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Hagerstown,MD	**Date Submitted:**	5/21/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Hagerstown Armory	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	5/28/2010
Attention:	[redacted]			**Report Date:**	6/1/2010

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
1047819	H-W-17	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047820	H-W-18	Flame	Wipe	****	0.111	110	ug/ft²	15	130	ug/ft²	
1047821	H-W-19	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047822	H-W-20	Flame	Wipe	****	0.111	110	ug/ft²	20	180	ug/ft²	
1047823	H-W-21	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	

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

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

Nida Mc.

Analyst: Nida McGarvey

Technical Manager: G Edward Carney

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 19407

Analysis Type:	Flame
Sample Type:	Air
Analysis Date:	5/28/2010

	Result		Percent Recovery	RPD	Comment
Preparation Blank	-0.036	ppm			Acceptable
Report Limit Verification Sample	0.2222	ppm	88.9%		Acceptable
Expected Spike Level (ppm) 0.25					
Duplicate Sample 1		mg/Kg			
Duplicate Sample 2		mg/Kg			Acceptable
Matrix Spike Analysis					
Spiked Sample					Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample 1	129.952	µg	104.51%		Acceptable
Laboratory Control Sample 2	132.220	µg	101.95%	2.48%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999723

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
507186	47800	H-A-1
507186	47801	H-A-2

SDG Number: 19407

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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507186	47802	H-A-3
507187	47824	CV-A-1
507187	47825	CV-A-2
507187	47826	CV-A-3
507236	48861	002 Personal 2443-4-13-10
507236	48862	002 Personal 505A-4-14-10
507236	48863	002 Personal 8958-4-15-10
507236	48864	002 Personal 505A-4-16-10
507236	48865	002 Personal 8958-4-21-10
507236	48866	002 Personal 505A-4-22-10
507236	48867	002 Personal 505A-4-26-10
507236	48868	002 Personal 2443-4-27-10
507236	48869	002 Personal 505A-4-29-10
507236	48870	002 Personal 2443-4-30-10
199937	49357	052710-LOC-01A
199937	49358	052710-LOC-02A
199937	49359	052710-LOC-03A
199937	49360	052710-LOC-04A

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 19392

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	5/27/2010

	Result		Percent Recovery	RPD	Comment
Preparation Blank	0.012	ppm			Acceptable
Report Limit Verification Sample	0.2843	ppm	85.3%		Acceptable
Expected Spike Level (ppm) 0.3333					
Duplicate Sample 1		mg/Kg			
Duplicate Sample 2		mg/Kg			Acceptable
Matrix Spike Analysis					
Spiked Sample					Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample 1	194.431	µg	102.31%		Acceptable
Laboratory Control Sample 2	188.033	µg	106.08%	3.62%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999615

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
507186	47803	H-W-1
507186	47804	H-W-2

SDG Number: 19392

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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507186	47805	H-W-3
507186	47806	H-W-4
507186	47807	H-W-5
507186	47808	H-W-6
507186	47809	H-W-7
507186	47810	H-W-8
507186	47811	H-W-9
507186	47812	H-W-10
507186	47813	H-W-11
507186	47814	H-W-12
507186	47815	H-W-13
507186	47816	H-W-14
507186	47817	H-W-15
507186	47818	H-W-16
507186	47819	H-W-17
507186	47820	H-W-18
507186	47821	H-W-19
507186	47822	H-W-20

AMA Analytical Services, Inc.

Focused on Results!!

NVLAP
101143-0
NY ELAP
10920
AIHA
AIHA
100470

Submitting Samples for National Guard Jobs

1) All samples shall be submitted to AMA Analytical Services, Attn: Sample Receiving, utilizing the enclosed Chain-of-Custody Form. The highlighted areas must be completed by the Subcontractor, however, the Sample Information/Analysis/Matrix section will not need to be completed if field date sheets are submitted with the samples. Please be sure to include a contact phone number for the person submitting the samples.
2) Results shall be reported via email to [redacted]s:
   a. National Guard Subcontracto[redacted] @bonusenvironmental.com
   b. [redacted]IV NGB: [redacted]us.army.mil
   c. [redacted]CIV NGB[redacted]rmy.mil
3) Hard Copy Reports & Invoices shall be handled in the following manner:
   a. Original Invoices and Copies of Reports shall be sent to the National Guard
      National Guard Bureau
      Attn: [redacted]
      301-IH Old Bay Lane
      Attn: NGB-AVN-SI, State Military Reservation
      Havre de Grace, Maryland 21078
   b. Original Reports shall be sent the National Guard Subcontractor

      Attn: [redacted]
      office: 989-779-7686
      cell: 989-621-3862

4) All Pb Wipes shall be handled in the following manner:
   a. All samples shall be analyzed utilizing FLAA procedures
   b. Samples whose results are reported as less than the reporting limit, and the reporting limit is greater than 40ug/ft2 shall be re-analyzed utilizing GFAA procedures.
5) All other samples – Pb Paints, Soils, & Airs, PCM Airs, PLM Bulks, TEM Airs, & TEM Bulks shall be analyzed utilizing standard analytical procedures

Asbestos · Lead · Mold

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507186

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) Sheet 1 of 2

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

Submittal Information:
1. Job Name: Hagerstown Armory
2. Job Location: Hagerstown, MD
3. Job #: Hagerstown Armory
4. Contact Person [redacted] P.O. #: W912K6-09-A-0003
5. Submitted by: [redacted] @ phone # [redacted]

Signature [redacted]

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

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

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day + 5-28-10
☐ 2 Day Date Due: ______
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ [redacted] with Report
☒ [redacted] @bonusenvironmental.com
☐ Fax: [redacted] @us.army.mil
☐ Verb[redacted] @us.army.mil

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

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

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

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

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

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

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

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

Metals Analysis
- ☐ Pb Paint Chip ______(QTY)
- ☒ Pb Dust Wipe (wipe type Ghost) 21 (QTY)
- ☒ Pb Air 3 (QTY)
- ☐ Pb Soil/Solid ______(QTY)
- ☐ Pb TCLP ______(QTY)
- ☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Pb Furnace (Media ______) ______(QTY)

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

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
H-A-1	Field Blank	5-19	0	—				X		X						
H-A-2	W. Maint. Garage		862	—				X		X						
H-A-3	Rm S-3		854	—				X		X						
H-W-1	Field Blank		—	—				X				X				
H-W-2	Drill Hall		—	4"x4"				X				X				
H-W-3	Drill Hall		—					X				X				
H-W-4	Drill Hall		—					X				X				
H-W-5	Drill Hall		—					X				X				
H-W-6	Drill Hall		—					X				X				
H-W-7	W. LRS Storage		—					X				X				
H-W-8	W. LRS Storage		—					X				X				
H-W-9	W. LRS Storage		—					X				X				

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

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 5 / 21 / 10 @ 9:45 Via: FedEx By (Print): Surat Watson Sign: [signature]
2. Date/Time Analyzed: ___ / ___ / ___ @ ___ By (Print): ______ Sign: ______
3. Results Reported To: ______
4. Comments: ______ Via: Mail Date: 6 / 1 / 10 Time: 1904 Initials: AM

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

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) Sheet 2 of 2 **507186**

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
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4. Contact Person [redacted] P.O. #: W912K6-09-A-0003
5. Submitted by: [redacted] @ phone #: (410) 942-0273 [redacted]

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

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

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day + Date Due: 5-28-10
☐ 2 Day
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Incl [redacted] with Report
☒ [redacted] @ bonusenvironmental.com
☐ Fax [redacted] @us.army.mil
☐ Veri [redacted] @us.army.mil

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

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

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

Metals Analysis
☐ Pb Paint Chip ______(QTY)
☒ Pb Dust Wipe (wipe type Ghost) 21 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ______(QTY)
☐ Pb TCLP ______(QTY)
☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Pb Furnace (Media ______) ______(QTY)

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

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
H-W-10	W. LRS Storage	5-19	—	4"x4"				X				X				
H-W-11	W. LRS Storage	↓	—	↓				X				X				
H-W-12	W. Supply office	↓	—	↓				X				X				
H-W-13	Kitchen	↓	—	↓				X				X				
H-W-14	Recruiting	↓	—	↓				X				X				
H-W-15	classroom 141	↓	—	↓				X				X				
H-W-16	Rm S-3	↓	—	↓				X				X				
H-W-17	Rm 156	↓	—	↓				X				X				
H-W-18	E. Maint. Garage	↓	—	↓				X				X				
H-W-19	Shop Break Rm	↓	—	↓				X				X				
H-W-20	Battery Rm	↓	—	↓				X				X				
H-W-21	W. Maint. Garage	↓	—	↓				X				X				

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

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 5/21/10 @ 9:45 Via: FedEx By (Print): Surat Watson Sign: [signature]
2. Date/Time Analyzed: ___/___/___ @ ______ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ___/___/___ Time: ______
4. Comments: ______ Initials: ______

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Appendix C

Photographs

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Building Exterior, south entrance


Rm. 153, water stained ceiling tile


“Parts Room”/POL Room

East Maintenance Bays – PPE board


East Maintenance Bays – Vehicle Exhaust Ventilation

East Maintenance Bays - parts washer

Battery Room, exhaust hood

Battery Room

Drill hall

West Maintenance Bays – Vehicle Exhaust Ventilation

East LRS Storage, flammable cabinet

Appendix D

References

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1. Department of Defense Instruction (0001) 6055.1, Department of Defense Occupational Safety and Health (OS H) Program, August 19, 1998.

2. Army Regulation (AR) 11-34, The Army Respiratory Protection Program, February 15, 1990.

3. DA PAM 40-503, Medical Service, Industrial Hygiene Program, October 30, 2000.

4. Technical Manual (T.M) 5-810-1, Mechanical Design, Heating, Ventilation, and Air Conditioning, June 1991.

5. Threshold Limit Values (TLVs) and Biological Exposure Indices (BEls), American Conference of Governmental Industrial Hygienists (ACGIH), current edition.

6. Industrial Ventilation - A Manual of Recommended Practices, American Conference of Governmental Industrial Hygienists (ACGIH), current edition.

7. UFC 3-410-01 FA Heating, Ventilating, and Air Conditioning, 15 May 2003

8. Occupational Safety and Health Administration (OSHA) Lead in Construction Standard, 29 CFR 1926.62

9. OSHA Lead Standard 29 CFR 1910.1025

10. OSHA Respiratory Protection Standard 29 CFR 1910.134

11. Army Regulation (AR) 385-10, The Army Safety Program, August 23, 2007.

12. RP-1-2004, Office Lighting, Illuminating Engineering Society of North America (IESNA)/ANSI.

13. RP-7-2001, Industrial Lighting, (IESNA)/ANSI.

14. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Standard 62.1-2007, "Ventilation for Acceptable Indoor Air Quality".

15. ASHRAE Standard 55-2004 – "Thermal Environmental Conditions for Human Occupancy"

16. Title 24, CFR, Part 35, Subpart B, Sections 35.110, Definitions of Lead-Based Paint, Housing and Urban Development, U.S. Department of Housing.

17. OSHA Personal Protective Equipment 29 CFR 1910.132

18. OSHA Permissible Exposure Limit (PEL) for General Industry 29 CFR 1910.1000 Z-1 Table

19. Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Department of Health and Mental Hygiene, November 2008.

20. Mold Remediation in Schools and Commercial Buildings, U.S. Environmental Protection Agency, March 2001

21. Army Facilities Management Information Document on Mold Remediation Issues TG277, February 2002

22. OSHA Welding, Cutting, Brazing 29 CFR 1910.252

COMPLIANCE MANAGEMENT INTERNATIONAL

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Industrial Hygiene Survey Report

National Guard Facility
Hagerstown Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Hagerstown Readiness Center** **18500 Roxbury Road** **Hagerstown, MD 21740-9538**
Prepared By:	**Compliance Management International** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**December 18, 2012**
Report Date:	**January 28, 2013**

Non-Responsive [redacted]

Non-Responsive [redacted], **CIH**
Manager, Industrial Hygiene Services

Table of Contents

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on December 18, 2012, at the Hagerstown Readiness Center located at 18500 Roxbury Road, Hagerstown, MD 21740-9538. The survey was performed by Mr. [redacted], CIH and Mr. [redacted].

1. Lead surface and air samples were collected. Surface levels of lead were within recommended guidelines in all areas. Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m^3). See Section 3.0 for sampling results.

2. Lighting levels did not meet the American National Standard Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in the Physical Fitness/Exercise Room. See Section 4.0 for detailed findings.

3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were recorded. Carbon monoxide and relative humidity were within recommended guidelines at the time of this survey. Carbon dioxide was above the recommended level of 1,079 ppm in many areas. This is most likely due to the use of a temporary propane heater in the administrative areas. Temperature levels were <68°F (criteria of 68-79°F) in most areas due to the main heating system being out of service at the time of this survey. See section 5.0 for results.

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

   a. Sporadic water stained ceiling tiles throughout the facility that indicate sources of water infiltration (e.g. roof leaks and/or condensation on pipes);

   b. Propane heaters being used inside the building envelope;

   c. An FMS being connected to the Readiness Center (occasionally causes odors in the RC if the connecting door is left ajar).

Section 2.0 Operation Description & Observations

The Hagerstown Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, and storage areas. There were approximately 12 full-time employees stationed at this facility at the time of this survey. It was also noted that an FMS (Field Maintenance Shop) is attached to the Readiness Center.

The building was initially constructed in 1977 and included the Drill Hall and Firing Range. In 1997, the remainder of the building was constructed in 1997. The Firing Range was abated in 1995-1998. The building is a single story structure with a brick exterior. The interior walls are concrete block. The floors are concrete with vinyl floor tile.

Heat is normally supplied to the building using an oil-fired boiler with forced hot air and radiators; however, the boiler has been out of service since April 2012 and is currently being repaired. Until the boiler is returned to service, heat is being supplied by a portable propane heater in the administrative area. Several conditions were noted regarding this temporary heater:

1. The propane gas cylinder was not secured;
2. Electrical cords were running across the walkway creating a potential tripping hazard;
3. The propane heater contains an open flame.

Roof-top air conditioning units service the administrative portions of the building during the cooling season. RTU’s are serviced by ARNG personnel located at another facility by work order; there is no scheduled maintenance.

The firing range has been converted into a bulky item storage area.

There is no child-care facility in the building.

Overall housekeeping practices were good. The facility is well maintained.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared properly designed. There were no personnel complaints.

Section 3.0 Lead Testing

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

Lead Testing Results Summary

Sample #	Location	Bulk (%)	Air ug/m^3	Surface ug/ft^2
1	Drill Hall	*	<5.6	*
2	Room 142	*	<5.5	*
3	Blank	*	<3	*
4	Converted Firing Range Floor	*	*	170
5	Converted Firing Range Contents	*	*	<110
6	Converted Firing Range Light Fixture	*	*	<110
7	Converted firing Range Heating Unit	*	*	<110
8	Entrance to Converted Firing Range	*	*	160
9	Drill Hall Floor center	*	*	<110
10	Drill Hall Top of Storage Locker	*	*	<110
11	Kitchen Top of Ice Maker	*	*	<110
12	Classroom 141 Supply Vent	*	*	<110
13	Room 142 Office Desk	*	*	<110
14	Fitness Center Top of Stereo Stand	*	*	<110
15	Orderly Room Top of File Cabinet	*	*	<110
16	Room 158 Office Desk	*	*	<110
17	Recruiting Office Desk	*	*	140
18	Main Hall Copier	*	*	<110
19	Blank	*	*	<12
-	Criteria	0.5	50	200

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2 =** micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

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

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

Lead surface and air samples were collected.

- Surface levels of lead were within the recommended guideline for all locations.

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

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Section 4.0 Lighting

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

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Recruiting Office	71.0	50	Yes
Converted Firing Range Storage Bulky Items	18.0	10	Yes
Supply Room 123	68.0	30	Yes
Classroom 141	56.0	30-50	Yes
Office 142	45.8	30-50	Yes
Office 158	84.3	30-50	Yes
Classroom 157	36.4	30-50	Yes
Physical Fitness/Exercise	**26.0**	**30**	**No**
Office 154	79.9	50	Yes
Office 140	78.8	50	Yes
C Troop Orderly Offices	41.0	30-50	Yes
Men’s Locker Room	53.2	7	Yes
Men’s Latrine	69.5	5	Yes
Assembly Drill Hall	42.6	30-50	Yes
Women’s Latrine	84.7	5	Yes
Kitchen	55.1	50	Yes

Table Notes:

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

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

The lighting level did not meet the minimum recommended guideline in the Physical Fitness/Exercise Room. Lighting should be improved in this area.

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Section 5.0 Indoor Air Quality

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

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

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	59.9	49.0	408	2.4
Recruiting Office	**63.3**	52.1	651	3.6
Converted Firing Range	**53.2**	56.7	338	3.9
Supply Room 123	**52.9**	57.8	379	3.8
Classroom 141	**63.3**	55.8	**1,100**	1.9
Office 142	**66.9**	53.9	**2,006**	2.4
Office 158	70.9	48.1	**1,670**	1.6
Classroom 157	73.9	39.3	**1,183**	1.7
Physical Fitness/Exercise	**66.4**	45.6	1,040	1.6
Office 154	73.0	46.2	**1,266**	1.3
Office 140	71.8	41.1	**1,229**	1.6
C Troop Orderly Offices	70.2	43.3	756	1.0
Assembly/Drill Hall	**55.9**	51.6	380	1.1
Kitchen	**55.9**	55.9	460	0.9
Outdoors	**52.0**	57.7	350	1.5
Criteria	**68.0-79.0**	**30-60**	**<1,079**	**<9.0**

Table Notes:

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

Source: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62-2010 & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Relative humidity measurements were within the recommended guidelines. Temperature measurements were below the recommended 68°F in several areas. These areas are typically supplied with heat from the boiler which is currently nonoperational.

- Carbon dioxide levels measured exceeded the recommended ceiling of 1,079 parts per million (ppm). This indicates that outdoor air ventilation is not adequate in all areas.

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

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

    - Water stained ceiling tiles were observed occasionally throughout the facility. This indicates sources of water infiltration (e.g. roof leaks and/or condensation on pipes); all sources of water infiltration should be identified and repaired. Water stained ceiling tile should be removed and replaced.

    - Overall housekeeping was good.

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Section 6.0 Suspect Asbestos Containing Building Materials

Based on the age of the building (e.g., constructed in 1977) asbestos-containing materials (ACM) could be present in the facility. No suspect ACM was observed at the time of this survey. Inaccessible areas such as behind walls or crawlspaces were not inspected.

Section 7.0 Equipment

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

Equipment	Serial #	Calibration Date	Value
TSI Q-Trak IAQ Meter	02041015	8/2012	NA
Cal Light 400 Light Meter	K98364	4/2012	NA
TSI 4199 Calibrator	41460827002	8/2012	NA
SKC Air Sampling Pump	647631	12/17/2012	1.81 LPM
SKC Air Sampling Pump	648349	12/17/2012	1.81 LPM

Section 8.0 Limitations

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

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

Appendix A. Laboratory Analysis Report

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AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

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

Client:	National Guard Bureau	**Job Name:**	Hagerstown, MD-RC	**Chain Of Custody:**	514845
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	18500 Roxbury Road	**Date Submitted:**	12/21/2012
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	Non-Responsive [redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	12/27/2012 **Report Date:** 12/27/2012

Attention: Non-Responsive [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
13025475	1	Flame	Air	538	N/A	5.6	ug/m³	<3	<5.6	ug/m³	
13025476	2	Flame	Air	547	N/A	5.5	ug/m³	<3	<5.5	ug/m³	
13025477	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13025478	4	Flame	Wipe	****	0.111	110	ug/ft²	19	170	ug/ft²	
13025479	5	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
13025480	6	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
13025481	7	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
13025482	8	Flame	Wipe	****	0.111	110	ug/ft²	17	160	ug/ft²	
13025483	9	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
13025484	10	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
13025485	11	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
13025486	12	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
13025487	13	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
13025488	14	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
13025489	15	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
13025490	16	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
13025491	17	Flame	Wipe	****	0.111	110	ug/ft²	15	140	ug/ft²	
13025492	18	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
13025493	19	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

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

Client:	National Guard Bureau	**Job Name:**	Hagerstown, MD-RC	**Chain Of Custody:**	514845
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	18500 Roxbury Road	**Date Submitted:**	12/21/2012
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	12/27/2012 **Report Date:** 12/27/2012

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

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

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)
%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

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

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

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

Analyst: N. McGarvey / S. Chinnapad

Technical Manager: G Edward Carney

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

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 514845

1 of 2

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

Submittal Information:
1. Job Name: HAGERSTOWN, Md - RC
2. Job Location: 18500 Roxbury Rd
3. Job #: [redacted] P.O. #: W912K6-09-A-0003
4. Contact Person [redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted] Signature [redacted]

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

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

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day +
☐ 2 Day Date Due: 12/31/12
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Include [redacted] with Report
☒ Email [redacted] @ complianceplcce.com
☐ Fax: [redacted] @us.army.mil
☐ Verbal [redacted] @us.army.mil

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

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area)Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)
☒ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☒ Pb Dust Wipe (wipe type GW) 16 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

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

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1.	DRILL HALL	12/18	538					X								
2.	Room 142 (office)		547					X								
3.	BLANK		0					X								
4.	FIRING RANGE FLOOR			4"x4"				X								
5.	FIRING RANGE CONTENTS							X								
6.	FIRING RANGE LIGHT FIX.							X								
7.	FIRING RANGE HEATING UNIT							X								
8.	FIRING RANGE ENTRANCE							X								
9.	DRILL HALL CENTER							X								
10	DRILLHALL TOP of STORAGE LOCK.		Tube cracked during shipping. Sample Exposed.													
11.	KITCHEN TOP of ICE MAKER							X								
12.	Room 141 (CLASSROOM)		Tube cracked during shipping. Sample exposed.													

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time: Contact: By:
Highlighted samples = Possibility of cross contamination due to damaged tubes + exposed
Date/Time: Contact: By:
samples. (Please see attached email to dlarson-)
Date/Time: Contact: By:

LABORATORY STAFF ONLY (CUSTODY)
1. Date/Time RCVD: 12 / 21 / 12 @ 1130 Via: FEDEX By (Print): Chris Nicodemus Sign: [signature]
2. Date/Time Analyzed: ___ / ___ / ___ @ ___ By (Print): ___ Sign: ___
3. Results Reported To: ___ Via: ___ Date: ___ / ___ / ___
4. Comments: 7939 3323 C64

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) 514845

2 of 2

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

Submittal Information:
1. Job Name: HAGERSTOWN - Md - RC
2. Job Location: 18500 Roxbury Rd
3. Job #: PO #: W912K6-09-A-0003
4. Contact Person [redacted] @ phone # (410) 942-0273
5. Submitted by: Signature:

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

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

Comments:

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

REPORT TO:
- ☒ Includ[redacted]with Report
- ☒ Email[redacted] complianceplace.com
- ☐ Fax:[redacted]us.army.mil
- ☐ Verba[redacted]us.army.mil

Asbestos Analysis

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

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

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

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

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

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

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

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

Metals Analysis
- ☐ Pb Paint Chip ____ (QTY)
- ☒ Pb Dust Wipe (wipe type GW) 16 (QTY)
- ☒ Pb Air 3 (QTY)
- ☐ Pb Soil/Solid ____ (QTY)
- ☐ Pb TCLP ____ (QTY)
- ☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis

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

SAMPLE INFORMATION / **ANALYSIS** (TEM, PCM, PLM, LEAD, MOLD) / **MATRIX** (AIR, BULK, DUST, WATER AND OTHER, SPORE TRAP, TAPE, SWAB)

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	ANALYSIS / MATRIX
13. Room 142	OFFICE	12/18		4"x4"	Cracked tube - KSS
14. Fitness Center	Top of Stereo				Tube broken during shipping. Sample out of Tube.
15. Orderly Room	Top of File Cab				Cracked tube - KSS
16. Room 158	offices				X
17. Recruiting	OFFICE				No lid on sample upon receipt.
18. Floor - Main	Hall at Copier				Tube cracked during shipping. Sample Exposed.
19. BLANK					

CLIENT CONTACT (LABORATORY STAFF ONLY)

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

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

Appendix B. Photographs

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Hagerstown Readiness Center
December 18, 2012

Exterior of Facility

Exterior of Facility - Front

Assembly Hall

Converted Firing Range - Storage

FMS Shop Connected to Readiness Center

Boiler Room

Use of Temporary Heat – Propane Heater

Appendix C. Floor Plan

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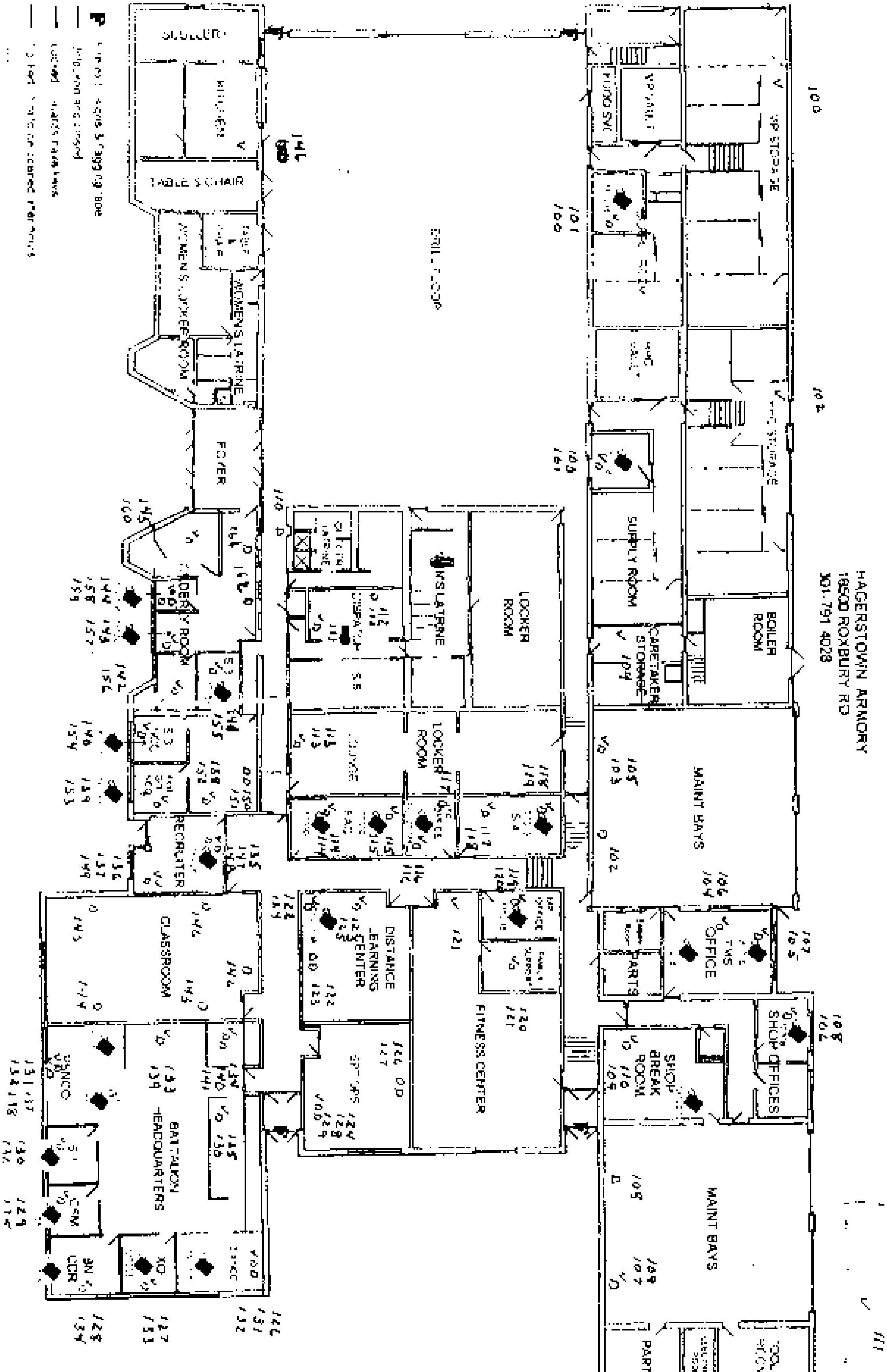
HAGERSTOWN ARMORY
SCULLERY
KITCHEN
TABLE & CHAIR
WOMENS LATRINE
FOYER
ORDERLY ROOM
RECRUITER
CLASSROOM
BATTALION HEADQUARTERS
DISTANCE LEARNING CENTER
FITNESS CENTER
LOCKER ROOM
MENS LATRINE
SUPPLY ROOM
CARETAKER STORAGE
BOILER ROOM
MAINT BAYS
OFFICE
PARTS
SHOP BREAK ROOM
SHOP OFFICES
PARTS

Appendix D. References

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

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

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

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

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

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

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

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

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

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

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

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

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

MCHB-TS-OFS

26 JULY 2005

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

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

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

2. The project number for this service reflects the current fiscal year of dispatch and the actual field work which was completed for fiscal year 2003. The State of Maryland Army National Guard occupational health nurse was immediately notified in writing of findings necessitating immediate corrective action in Maryland armories. In addition, the National Guard Bureau Region North Industrial Hygiene Office has been notified of all the results of lead in dust sampling conducted in all facilities. Draft reports were reviewed by you or other members of the National Guard and members of this Center, including our editorial staff, during drafting stages in report preparation leading up to the final report.

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

FOR THE COMMANDER:

[redacted]

Encl

Director, Occupational Health Sciences

Readiness thru Health

Printed on Recycled Paper

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

USACHPPM

MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEYS
HAVRE DE GRACE ARMORY
HAVRE DE GRACE, MD
PROJECT NO. 55-ML-01ED-03/05
8 APRIL 2003

Approved for public release; distribution unlimited

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

Readiness Thru Health

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

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

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

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

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

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

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

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

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

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

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

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEYS
HAVRE DE GRACE ARMORY
HAVRE DE GRACE, MD
PROJECT NO. 55-ML-01ED-03/05
8 APRIL 2003

1. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard (MDARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions. This survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee for the Defense Occupational and Environmental Health Readiness System.

2. CONCLUSIONS.

a. Lead in Air. 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. Lead in Dust. Levels of lead in dust that exceeded safe limits for children and adults were found in the armory. These levels may result in health hazards to employees and to children visiting the armory.

c. Lead in Paint. Chemical spot testing of deteriorated paint identified the presence of lead-based paint. Deteriorated lead-based paint is a potential hazard to armory occupants.

d. Lighting. Lighting in some areas of the armory did not meet the Illuminating Engineering Society of North America (IESNA) criteria. Inadequate lighting may impact employee vision and result in health and safety hazards.

e. Asbestos. There was a potential for exposure to asbestos in the armory. Armory records showed that asbestos had been abated; however, some exposed pipe insulation and some vinyl floor tiles that were intact may be asbestos-containing material (ACM). Some intact vinyl floor tiles may contain asbestos. If damage occurs in the future, asbestos tiles and the exposed pipe insulation may become friable and asbestos fibers may be released.

f. Mold. Excessive moisture in the armory had caused mold growth. Mold exposure may cause illness in armory employees.

g. Safety. The armory was continuing to address leaks in the roof and the resulting water damage. The roof and portions of the drop ceiling in the conference room were repaired in 2003 but the roof was reported to be leaking again in 2004. Armory work orders documented ongoing renovation work.

h. Ventilation. Weapons maintenance was being conducted in the Arms Room. There was no ventilation in this room. There were potential exposures to lead and cleaning solutions. Inadequate ventilation of this operation may be hazardous to employee health.

i. Hazardous Materials Management. The Hazardous Materials Storage Shed was unorganized and overcrowded. There was no written Hazard Communication (HAZCOM) Program. These findings may result in employee exposure to hazardous materials in the armory. The OSHA requires employers to provide information to their employees concerning hazardous chemicals to which they are exposed. This is accomplished by establishing a written HAZCOM program. Program elements include the use of labels and other forms of warning, material safety data sheets, and information and training addressing protective measures to employees.

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

a. Lead Exposure. Health Hazard RAC 3.

(1) Occupational Exposure. Repair and stabilize all deteriorated paint. Clean the Drill Hall, Locker Room, and administrative area horizontal surfaces that have elevated lead levels to the National Guard Bureau (NGB) Region North and U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended safe limit for floors and frequently contacted surfaces. Comprehensive guidelines for cleaning are in Appendix E. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after clean up. Cleaning dust containing lead may further prevent lead from becoming redistributed into adjacent rooms and resulting in exposures for children and for the general workforce. Ensure that personnel wear disposable gloves and disposable coveralls as extra protection when working in all areas identified as having elevated levels of lead.

(2) Child Exposure. Address all potential lead hazards before continuing to extend use of this facility to children. Clean the floor in the Drill Hall to the Environmental Protection Agency lead in dust standards for young children, and clean other horizontal surfaces in the Drill Hall to the NGB Region North and USACHPPM decontamination level for lead in dust on frequently contacted surfaces.

b. Lighting. Health Hazard RAC 4. Increase lighting in Room 121, Room 106, and the Classroom to meet the IESNA recommended guidelines as indicated in Table 2, Lighting. Provide portable task lighting for Rooms 121 and 126. Provide additional ceiling lighting in the Classroom.

c. Asbestos Exposure. Health Hazard 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 Asbestos Management Plan (AMP) for Havre de Grace Armory.

(2) If records cannot be located, sample the exposed pipe insulation and vinyl tiles to determine whether they are ACM.

(3) If they are determined to be asbestos and become damaged, they must be encapsulated or removed as soon as possible.

(4) 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.

d. Mold Exposure. Health Hazards RAC 4. Remove and replace ceiling tiles with mold growth. Abate all areas of visible mold. For additional guidance on moisture control and mold remediation in the armory refer to USACHPPM TG 278, Industrial Hygiene/Preventive Medicine Mold Assessment Guides, and USACHPPM TG 277, Army Facilities Management Information Document on Mold Remediation Issues in Appendix F.

e. Safety Hazards. Safety Hazards RAC 3. Continue to repair roof leaks and damaged building materials. Replace loose ceiling tiles.

f. Ventilation. Health Hazards RAC 4. Conduct weapons maintenance in an area where there is adequate ventilation.

g. Hazardous Materials Management. Health Hazards RAC 3. Organize the Hazardous Materials Storage Shed. Establish a written HAZCOM Program. Maintain records for HAZCOM training and store them in an accessible area.

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MDARNG Facilities III Baseline Surveys, Havre de Grace Armory, Havre de Grace, MD, Project No. 55-ML-01ED-03/05

TABLE OF CONTENTS

Paragraph Page

Appendices

Tables

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
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MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEYS
HAVRE DE GRACE ARMORY
HAVRE DE GRACE, MD
PROJECT NO. 55-ML-01ED-03/05
8 APRIL 2003

1. 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. Fax, National Guard Bureau (NGB) Region North Industrial Hygiene Office (NGB-AVS-SI-IH/Ms. Non-Responsive), 28 February 2003, subject: SAB.

4. BACKGROUND INFORMATION.

a. Armory Units, Organizations, and Mission. The Havre de Grace Armory is a Federal building and is located on the Havre de Grace Military Reservation. The resident units and organizations include the Headquarters and Headquarters Detachment, 1297th Corps Support Battalion, a general support maintenance company; the 2729th Transportation Detachment, and the Organizational Maintenance Shop #3. The armory was originally built for use as a racetrack clubhouse. The building has a detached chemical and petroleum, oil and lubricant storage area. All vehicle maintenance is conducted outdoors except during inclement weather, when it is conducted in the organizational maintenance shop.

b. Date of Construction. The building is approximately 100 years old.

c. Armory Use by Children. The point of contact (POC) stated that the armory is occupied by children a minimum of four times per year for a period of several hours for each visit. Events include summer picnics and holiday meals in the Drill Hall. The Maryland Military Department is currently advertising Havre de Grace Armory as available for rental for activities that include young children.

d. POC. MAJ [redacted] 410-278-8450, 301 Old Bay Lane, Havre de Grace, MD 21078-4094.

5. FACILITY EVALUATION.

a. Sampling Locations and Results. Samples were collected for lead in air, on surfaces (wipe samples), and in chemical spot tests to determine the presence of lead hazards. Lead sample results and locations are shown in Appendix B. Lighting levels were measured in office and classroom areas.

b. Physical Condition of Facilities.

(1) Paint. The age of the buildings indicated that the presence of lead-based paint was likely. Some areas of deteriorated paint were found. Staff Sergeant (SSG) [redacted], Environmental Compliance Assessment Coordinator for the Maryland NGB, stated that records showed that all lead has been abated in the former indoor firing range (IFR), but that there were no records of lead-based paint abatement in the armory.

(2) Asbestos. SSG [redacted] stated that all asbestos had been abated in the facility, including asbestos tile. However, some exposed pipe insulation and some of the tiles that were intact may be asbestos-containing material (ACM). A site Asbestos Management Plan (AMP) was not located.

(3) Mold and Moisture Problems. There was mold in the gym area. There was water damage in the Weight Room, and on the ceiling in the Mess Hall and Drill Hall.

(4) Hazardous Materials Management. All chemicals and hazardous materials were stored in the outdoor Hazardous Materials Storage Shed. Products included antifreeze, brake fluid, hydraulic fluid, motor oil, and other lubricants.

(5) Safety Hazards. The facility was aging and the roof had leaked for several years. The roof and portions of the drop ceiling in the Conference Room were repaired in 2003 but the roof was reported to be leaking again in 2004. We reviewed armory work orders that documented ongoing renovation work.

(6) IFR. The IFR had been closed, all lead abated, and cleaned.

c. Safety and Occupational Health Programs. There were accessible material safety data sheets (MSDSs); however, there was no written Hazard Communication (HAZCOM) Program.

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d. Heating, Ventilation, and Air-Conditioning Systems. The building was heated by an oil-fired furnace, and many rooms had steam baseboard radiators. Cooling was accomplished by several window type air conditioners mounted in regularly used offices, and by manual operation of windows. At the time of the survey, weapons maintenance was being conducted in the Arms Room. There was no ventilation in this room.

e. Noise Dosimetry. No operations with the potential to generate hazardous noise levels were identified.

f. Housekeeping. In general, armory and contract personnel appeared to practice good housekeeping. Custodial duties were performed by contract housekeeping personnel.

6. ASSESSMENT CRITERIA FOR LEAD. See Appendix C for details.

a. Lead in Air. The Army complies with the Occupational Safety and Health Administration (OSHA) 8-hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter ($\mu g/m^3$) of air.

b. Lead in Dust. The Environmental Protection Agency (EPA) and State of Maryland limits for lead in dust are 40 micrograms per square foot ($\mu g/ft^2$) on floors, 250 $\mu g/ft^2$ on window sills, and 400 $\mu g/ft^2$ in window troughs. These limits apply to pre-1978 Army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The NGB Region North concurs with the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended safe limit of 200 $\mu g/ft^2$ on floors and frequently contacted surfaces, which is more stringent for window sills than the EPA/State standards.

c. Lead in Paint. Paint containing lead levels of 0.5 percent or more by weight in dried solid (also reported as 5000 milligrams per kilogram) is considered to be lead-based paint according to both Federal and Maryland State Regulations. Paint containing lead levels of more than 0.7 milligrams per square centimeter is considered to be lead-based paint according to Maryland State Regulations. In Army Regulation 420-70, Buildings and Structures, lead-contaminated paint is defined as any paint containing detectable amounts of lead. The Army considers lead-contaminated paint to be potentially hazardous to children if it is disturbed or deteriorating.

d. Lead Carcinogenicity. The Department of Health and Human Services National Toxicology Program (NTP) released the Report on Carcinogens, Eleventh Edition in February 2005. The NTP report lists "lead and lead compounds" as "reasonably anticipated to be human carcinogens".

7. PHOTOGRAPHS. See Appendix D.

8. SAMPLING RESULTS, DISCUSSION, AND CONCLUSIONS.

a. Lead in Air. General area lead in air sampling was conducted in the 1297th Supply Room, the HD Commo Room, and in the Drill Hall. The air sample results were below laboratory reporting limits of 3 µg/m³ to 4 µg/m³. All air samples were below the OSHA standard of 50 µg/m³ for lead in air. There was no overexposure to personnel from lead in air in this building.

b. Lead in Dust. Levels of lead in dust that exceeded safe limits for children and adults were identified on top of the 2729th Transportation Detachment display board in the front door foyer, in the Drill Hall above the window ledge, and on top of a wall locker in Room 106. These levels may result in health hazards to employees and to children visiting the armory. Lead in dust sample locations and analytical results are shown in Table 1. All sample results that were greater than or equal to 40 µg/ft² for floors or 200 µg/ft² for other surfaces are highlighted.

TABLE 1. Lead in Dust Wipe Locations and Analytical Results.

Sample Numbers	Type of Sample	Locations	Result µg/ft²
HDW01	Wipe	Former IFR top of shelves	74
HDW02	Wipe	Drill Hall floor by stairs/one foot from wall	58
HDW03	Wipe	Drill Hall floor by stairs/one foot from wall	36
HDW04	Wipe	Drill Hall floor by stairs/three feet from wall	<23
HDW05	Wipe	Kitchen counter top	<23
HDW06	Wipe	Kitchen top of refrigerator	28
HDW07	Wipe	Drill Hall top of window casing	3527
HDW08	Wipe	Room 128 Break Room top of gray storage cabinet	<23
HDW09	Wipe	Front door foyer/top of divider/2729th display board	5045
HDW10	Wipe	Bn XO Office, desk top next to hallway door	77
HDW11	Wipe	Room 106/1297th CSB Supply Room top of wall locker	364

c. Lead in Paint. Chemical spot testing was used to identify deteriorated lead-based paint. Qualitative lead testing was conducted with chemical spot tests according to the American Society for Testing and Materials E1753-04 Standard Practice for Use of Qualitative Chemical Spot Test Kits for Detection of Lead in Dry Paint Films. Deteriorated lead-based paint is a potential hazard to armory occupants.

d. Lighting. Lighting levels were measured in frequently used areas of Room 121, Room 106 and the Classroom. The results are shown in Table 2. The Illuminating Engineering Society of North America (IESNA) recommends a minimum illumination level of 11-30 foot-candles (fc) for occasional visual tasks (such as locating tools and supplies), 31-50 fc for performing large-scale tasks (such as major vehicle repair operations), and 51-100 fc for tasks of medium contrast and small size (such as general office work). Lighting levels in Room 121, Room 106, and the Classroom did not meet these criteria. Inadequate lighting may impact employee vision and result in health and safety hazards.

TABLE 2. Lighting Levels

Room	Location	Illumination, foot-candles
Room 121	Desktop	11.3-18.6
Classroom	Various locations	12.0-17.7
Room 106/1297th CSB Supply Room	Various locations	18.4-57

e. Asbestos. There was a potential for exposure to asbestos in the armory. Armory records showed that asbestos had been abated; however, some exposed pipe insulation and some vinyl floor tiles that were intact may contain asbestos. If damage occurs in the future, they may become friable and asbestos fibers may be released. Army policy requires the armory to establish and execute an AMP for all asbestos in the facility, and to take immediate corrective action where a possible asbestos related health hazard has been identified.

f. Mold. Excessive moisture in the armory had caused mold growth. Mold exposure may cause illness in armory employees.

g. Safety. The armory has continued to address leaks in the roof and the resulting water damage. Employees are potentially exposed to hazards if ceiling tiles fall and to slip hazards from water on the floor.

h. Ventilation. Weapons maintenance was being conducted in the Arms Room, and there was no ventilation in this room. There were potential exposures to lead and cleaning solutions. Inadequate ventilation of this operation may be hazardous to employee health.

i. Hazardous Materials Management. The Hazardous Materials Storage Shed was unorganized and overcrowded. (See Photograph numbers 699-700). There was no written HAZCOM Program. These deficiencies may result in employee overexposure to hazardous materials in the armory. The OSHA requires employers to provide information to their employees concerning hazardous chemicals to which they are exposed. This is accomplished by establishing a HAZCOM Program for armory employees. Program elements include the use of labels and other forms of warning, MSDSs, and information and training addressing protective measures for employees.

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

a. Lead Exposure. Health Hazard RAC 3.

(1) Occupational Exposure. Repair and stabilize all deteriorated paint. Clean the Drill Hall, Locker Room, and administrative area horizontal surfaces that have elevated lead levels to the NGB Region North and USACHPPM recommended safe limit for floors and frequently contacted surfaces. Comprehensive guidelines for cleaning are in Appendix E. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after clean up. Cleaning dust containing lead may further prevent lead from becoming redistributed into adjacent rooms and resulting in exposures for children and for the general workforce. Ensure that personnel wear disposable gloves and disposable coveralls as extra protection when working in all areas identified as having elevated levels of lead.

(2) Child Exposure. Address all potential lead hazards before continuing to extend use of this facility to children. Clean the floor in the Drill Hall to the EPA lead in dust standards for young children, and clean other horizontal surfaces in the Drill Hall to the NGB Region North and USACHPPM decontamination level for lead in dust on frequently contacted surfaces.

b. Lighting. Health Hazard RAC 4. Increase lighting in Room 121, Room 106, and the Classroom to meet the IESNA recommended guidelines as indicated in Table 2, Lighting. Provide portable task lighting for Room 121 and Room 126. Provide additional ceiling lighting in the Classroom.

c. Asbestos Exposure. Health Hazard 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 Havre de Grace Armory.

(2) If records cannot be located, sample the exposed pipe insulation and vinyl tiles to determine whether they are ACM.

(3) If they are determined to be asbestos and become damaged, they must be encapsulated or removed as soon as possible.

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(4) 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.

e. Mold Exposure. Health Hazard RAC 4. Remove and replace ceiling tiles with mold growth. Abate all areas of visible mold. For additional guidance on moisture control and mold remediation in the armory refer to USACHPPM TG 278, Industrial Hygiene/Preventive Medicine Mold Assessment Guides, and USACHPPM TG 277, Army Facilities Management Information Document on Mold Remediation Issues in Appendix F.

f. Safety Hazards. Safety Hazard RAC 3. Continue to repair roof leaks and damaged building materials. Replace loose ceiling tiles.

g. Ventilation. Health Hazard RAC 4. Conduct weapons maintenance in an area where there is adequate ventilation.

h. Hazardous Materials Management. Health Hazard RAC 3. Organize the Hazardous Materials Storage Shed. Establish a written HAZCOM Program. Maintain records for HAZCOM training and store them in an accessible area.

10. SITE MAPS. See Appendix G.

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

[redacted]

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

APPROVED:

[redacted]

Technical Program Manager
Industrial Hygiene Field Services Program

APPENDIX A

REFERENCES

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APPENDIX A

REFERENCES

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.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf

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

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

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

6. American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs), ACGIH Cincinnati, OH, 2004. http://www.acgih.org/TLV/

7. American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc. (ASHRAE) 62-2002, Ventilation for Acceptable Indoor Air Quality, 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. USACHPPM Interim Report No. 39-EJ-1157-99, Derivation of Wipe Surface Screening Levels for Environmental Chemicals, 1999.

10. OSHA Instruction, CPL 02-02-058 - CPL 2-2.58 - 29 CFR 1926.62, Lead Exposure In Construction; Interim Final Rule-- Inspection and Compliance, Procedures, 1993. http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=1570

11. U.S. Department of Housing and Urban Development (HUD), Technical Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing 1998. http://www.hud.gov/offices/lead/guidelines/hudguidelines/index.cfm

APPENDIX B

SAMPLING SHEETS AND LAB ANALYSES

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TEST REPORT
Page 1 of 2
4/18/03

DATA CHEM
LABORATORIES
A SORENSON COMPANY

Submitted To: [redacted]
NGB, ANG Region IH North
ATTN: NGB-AVS-S1
301 Old Bay Ln.
Havre de Grace, MD 21078-4094

Reference Data:	Lead
Client Sample No.:	HDAir1 through Blank
P.O. No.:	Not Available
Sample Location:	Havre de Grace, MD
Sample Type:	Filter
Method Reference:	NIOSH 7300
DCL Set ID No.:	03-S-1836
DCL Sample ID No.:	03-11968 through 03-11971
Sample Receipt Date:	4/17/2003
Preparation Date:	04/17/03
Analysis Date:	04/18/03

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

The sample condition upon receipt was acceptable except where noted.

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

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

[redacted]
Analyst

[redacted]
Reviewer

CINCINNATI OFFICE
4900 GLENDALE-MILFORD ROAD
CINCINNATI, OHIO 45242-3700
513 733-5336, FAX 513 733-5347

WEST COAST OFFICE
11 SANTA YORMA COURT
NOVATO, CALIFORNIA 94945
800 280-0071, FAX 415 893-9469

LEADING ANALYTICAL CHEMISTRY INTO THE 21ST CENTURY™

TEST REPORT
Page 2 of 2
03-S-1836

Results
Lead

Client #	DCL #	Sample Volume (L)	µg/sample	mg/m^3
HDAir1	03-11968	382	ND	<0.003
HDAir2	03-11969	354	ND	<0.003
HDAir3	03-11970	264	ND	<0.004
Blank	03-11971	0	ND	-
	Prep Blank		ND	
% Recovery	LCS		109.	
RPL			1.	

ND indicates that the value was not detected at or above the reporting limit (RPL).
LCS stands for laboratory control sample.

Non-Responsive [redacted]

Non-Responsive [redacted]

Reviewer

Reservoirs Environmental, Inc.

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

April 21, 2003

Project Description:
RES 92201-1
55MA014W
None Given

[redacted]
Army National Guard IH - West
3401 Quebec Street
Denver CO 80207

Dear Customer,

Reservoirs Environmental, Inc. is an environmental 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 Absorption (AA) / 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 Table I. Results have been faxed to your office.

RES 92201-1 is the job number assigned to this study. This report is considered highly confidential and property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you should have any questions about this report, please feel free to call me at 303-964-1986.

Sincerely,

[redacted]

President

RESERVOIRS ENVIRONMENTAL, INC.

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

TABLE I. ANALYSIS: LEAD BY WIPE SAMPLING

RES Job Number:	**RES 92201-1**
Client:	**Army National Guard III - West**
Client Project Number / P.O.:	**55MA014W**
Client Project Description:	**None Given**
Date Samples Received:	**April 18, 2003**
Analysis Type:	**USEPA SW846 3050B / AA(7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**April 21, 2003**

Client ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
HD Blank 1	EM 762898	0.11	BDL	23	BDL
HD W1	EM 762899	0.11	8.1	23	74
HD W2	EM 762900	0.11	6.4	23	58
HD W3	EM 762901	0.11	4.0	23	36
HD W4	EM 762902	0.11	BDL	23	BDL
HD Blank 2	EM 762903	0.11	BDL	23	BDL
HD W5	EM 762904	0.11	BDL	23	BDL
HD W6	EM 762905	0.11	3.1	23	28
HD W7	EM 762906	0.11	388.0	23	3527
HD W8	EM 762907	0.11	BDL	23	BDL
HD W9	EM 762908	0.11	555.0	23	5045
HD Blank 3	EM 762909	0.11	BDL	23	BDL
HD W10	EM 762910	0.11	8.5	23	77
HD W11	EM 762911	0.11	40.0	23	364

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

BDL = Below Detection Limit

Data Qa

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APPENDIX C

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE

ASSESSMENT CRITERIA FOR LEAD

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

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 µg/ft². This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. The EPA standards (40 CFR 745.227(e) (8) (viii)) and State of Maryland standards are not directly applicable because they are developed for floors (40 µg/ft²), windowsills (250 µg/ft²)and window troughs (400 µg/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. The OSHA has no specific requirement for work area surfaces. The OSHA lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. The OSHA cites a level of 200 µg/ft² 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 µg/ft² 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 µg/m³ averaged over an 8-hour day. Therefore, based on these conditions there was no overexposure to personnel from lead in this building.

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APPENDIX D

PHOTOGRAPHS

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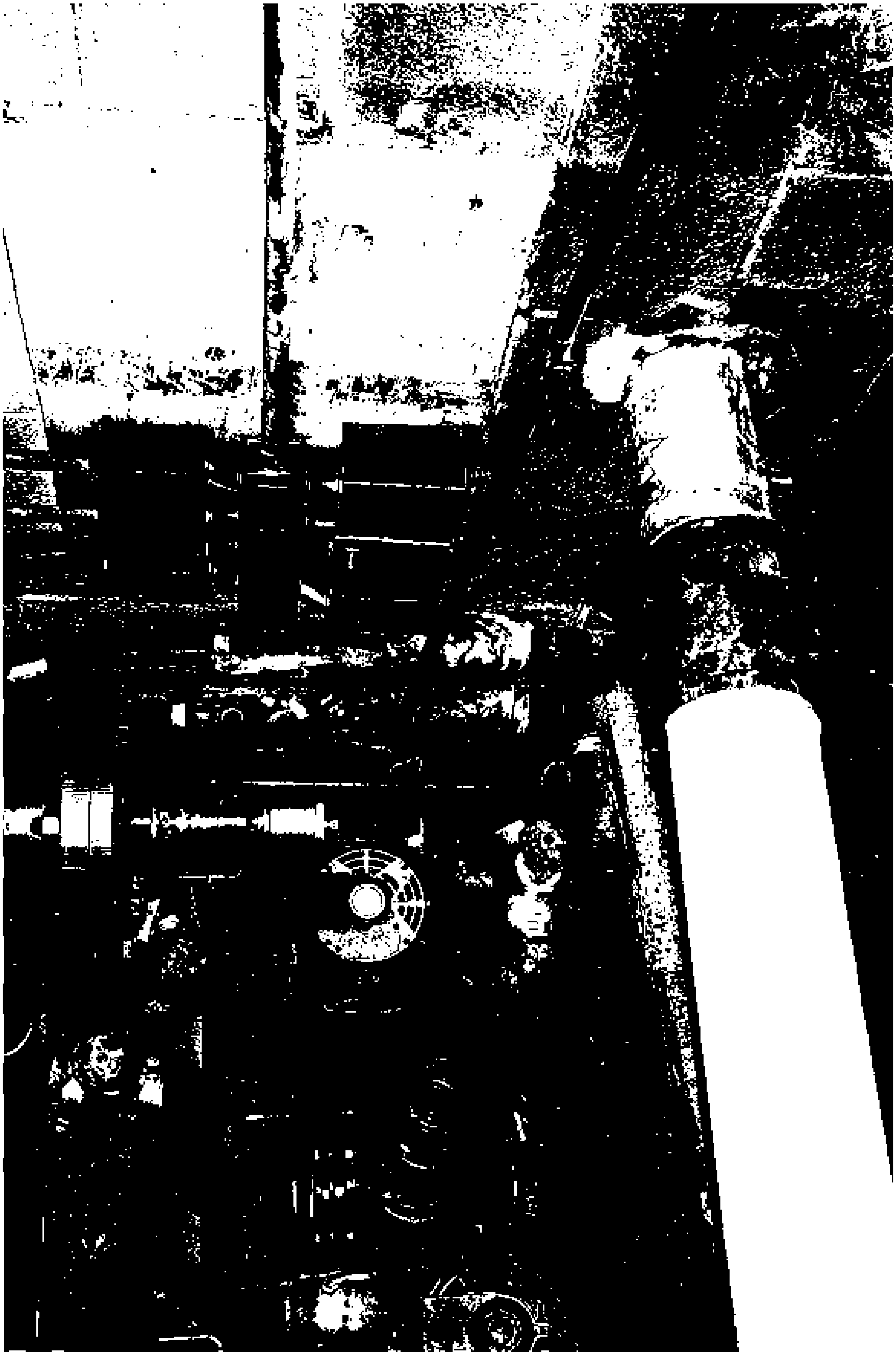
Havre de Grace Armory Photographs

Photo Number	Location
685	Basment/pipe insulation
686	Basment/pipe insulation
687	Room 106 Supply Room/ lead air sampling and lead in dust sampling
688	Plaque Room/Drill Hall/Mess Hall areas/water damage in ceiling
689	Plaque Room/Drill Hall/ deteriorated paint
690	Conference Room drop ceiling/water damage
691	Room 206/deteriorated paint on window sill
692	Drill floor by stair/lead in dust sampling
693	Kitchen counter top/lead in dust sampling
694	Kitchen top of refrigerator/lead in dust sampling
695	Plaque Room/Drill hall /above window ledge /lead in dust sampling
696	Rm 128 Break room top of gray storage cabinet/lead in dust sampling
697	Front door foyer/top of divider/1729th Maintenanee Board/lead in dust sampling
698	Bn XO Office desk top next to hallway door/lead in dust sampling
699	Hazardous Materials Storage area
700	Hazardous Materials Storage area



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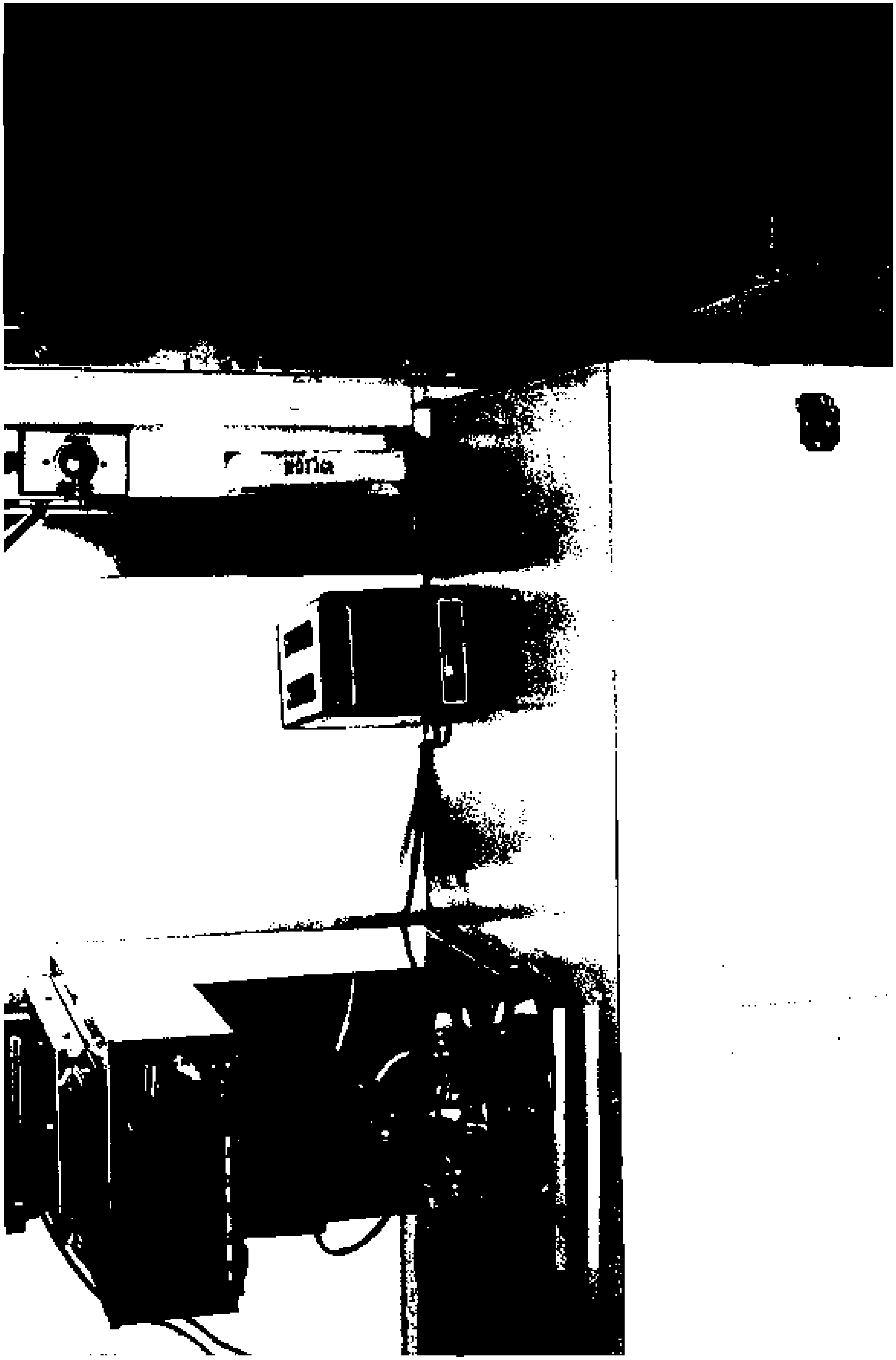

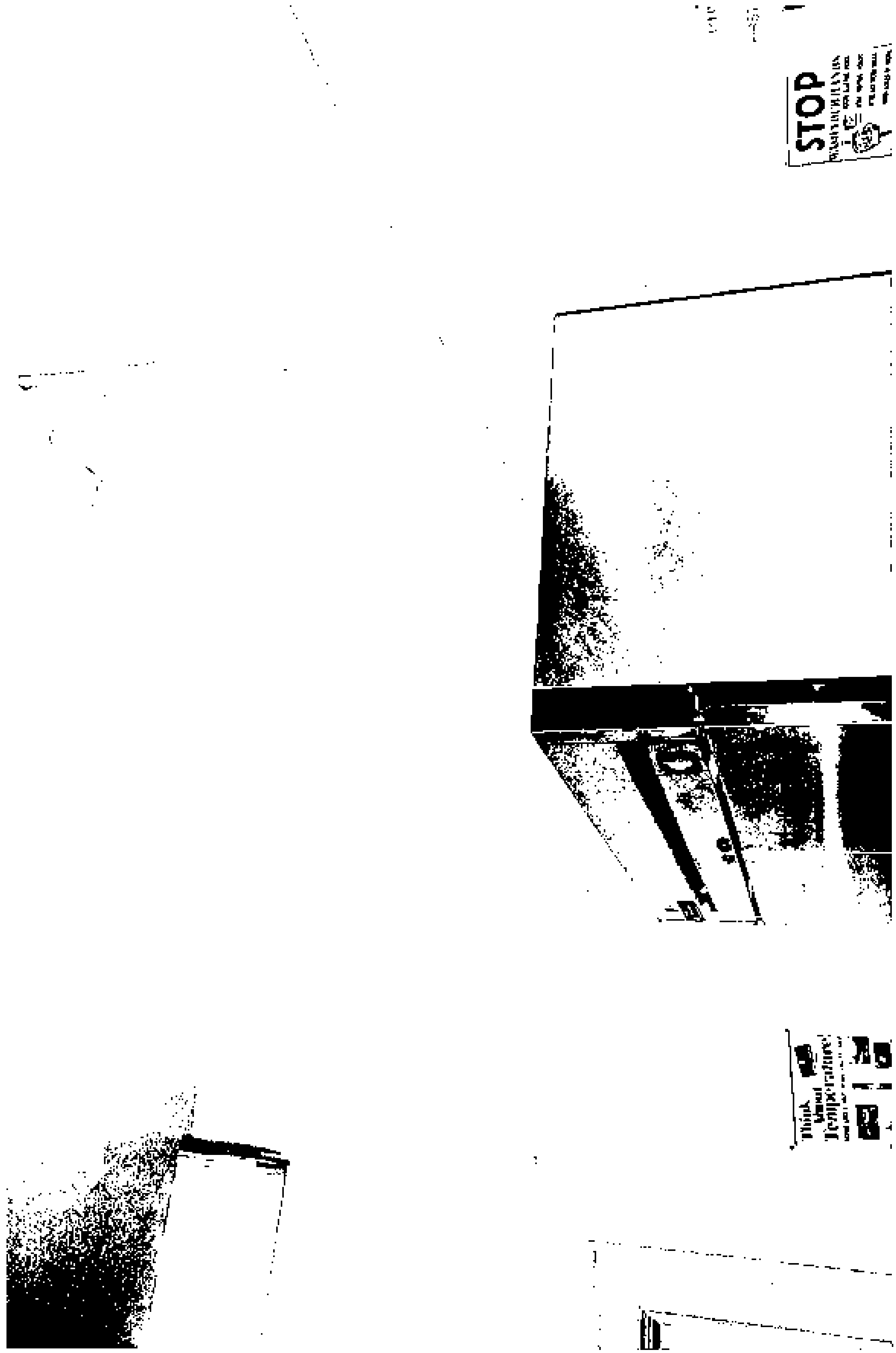
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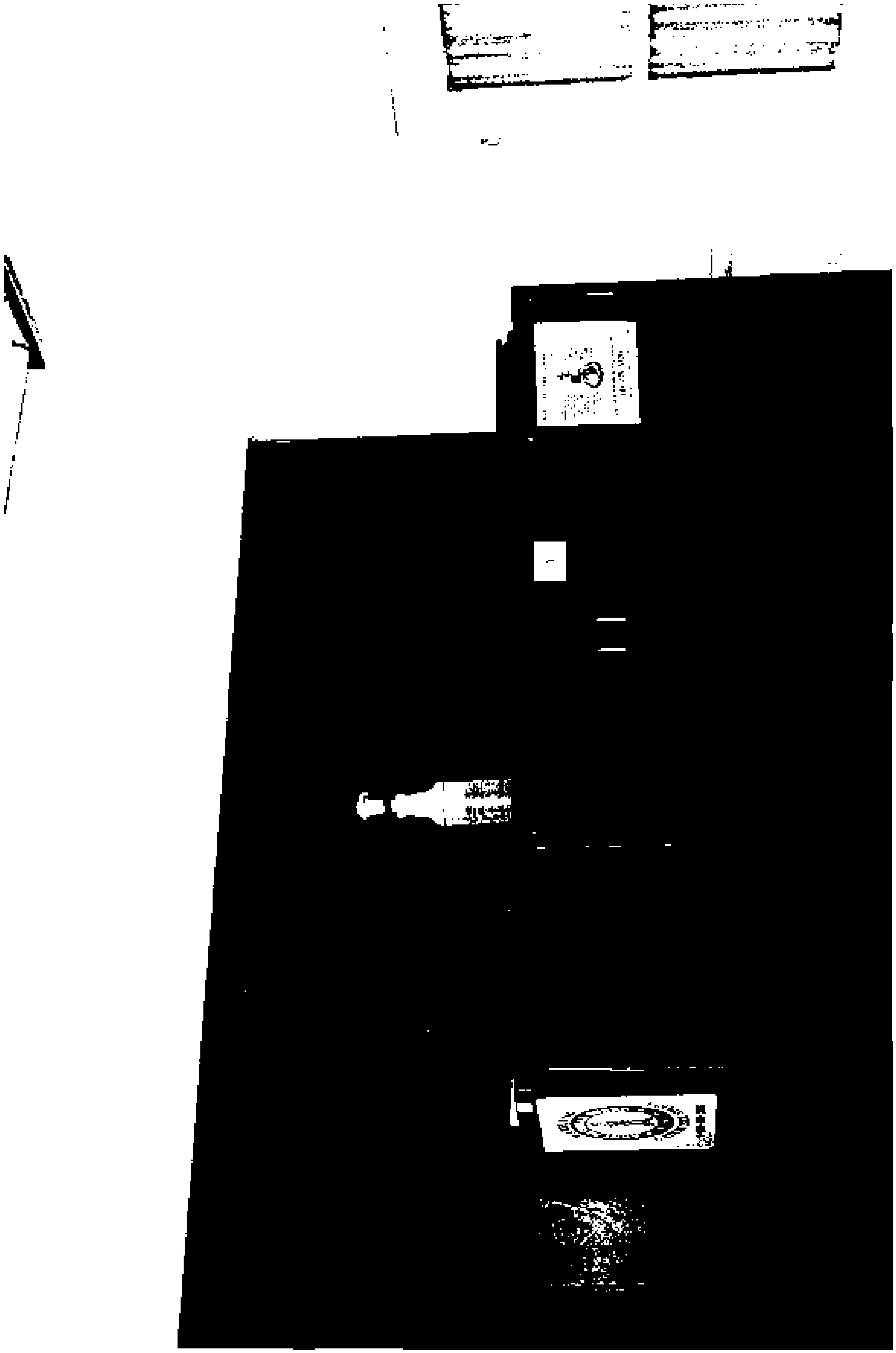

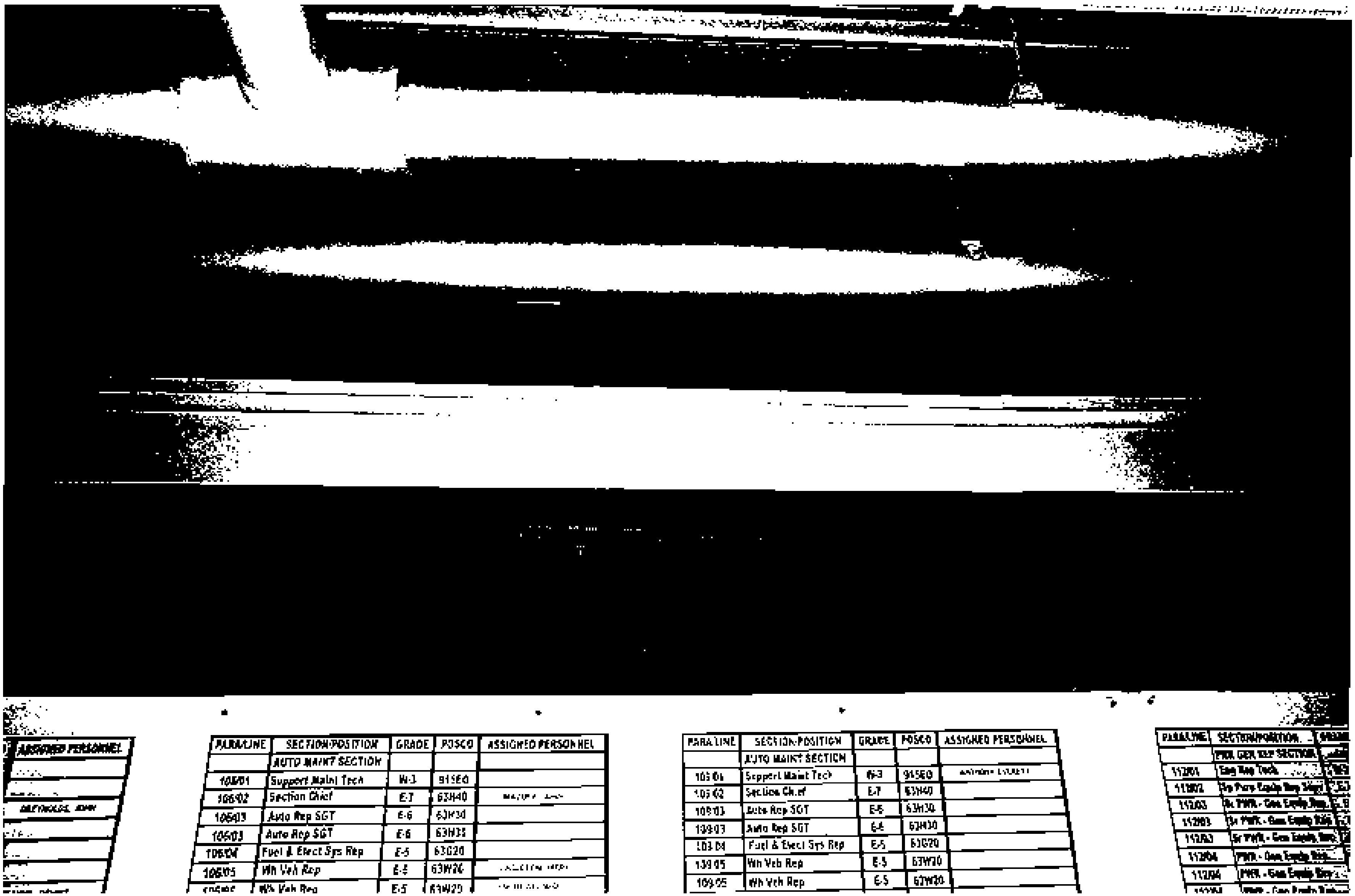

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APPENDIX E

LEAD CLEANING GUIDANCE

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

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CHAPTER 14: CLEANING

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.

2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.

3. Have sufficient cleaning equipment and supplies *before* beginning work.

4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.

5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.

6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.

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

8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.

9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.

10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.

11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.

12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.

13. Paint or otherwise seal treated surfaces and interior floors.

14. Conduct a clearance examination (see Chapter 15).

15. If clearance is not achieved, repeat the final cleaning.

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

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

18. Cleaning equipment list:

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

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Chapter 14: Cleaning

I. Introduction

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

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

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

A. Performance Standard

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

B. Small Dust Particles

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

C. Difficulties in Cleaning

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

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

1. Low Clearance Standards

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

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

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

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?
- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter 9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

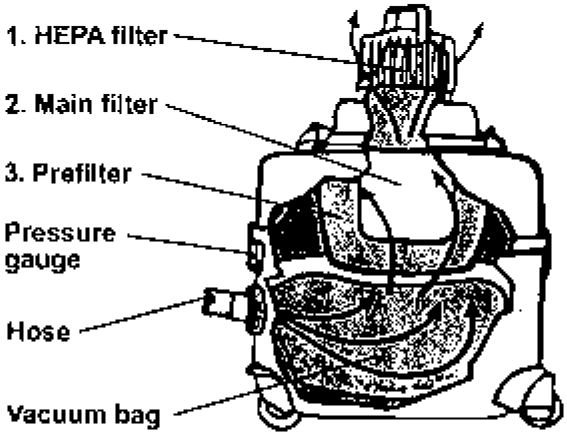
To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards and were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter 10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum
Most HEPA-vacuums have three filters: HEPA filter, main filter, and pre-filter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the pre-filter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

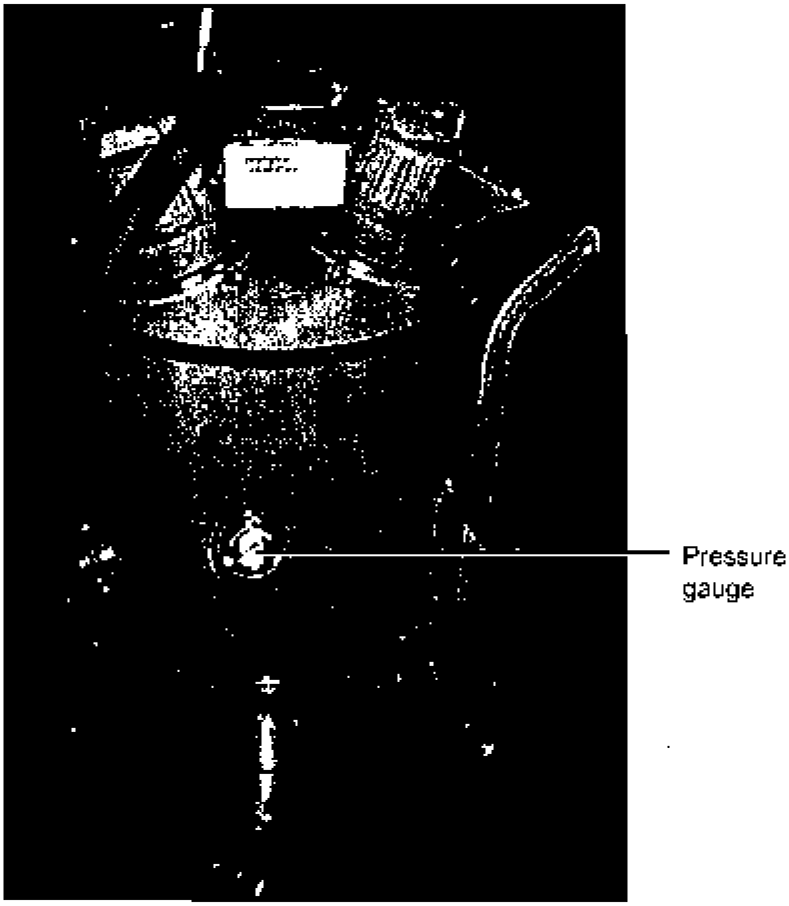
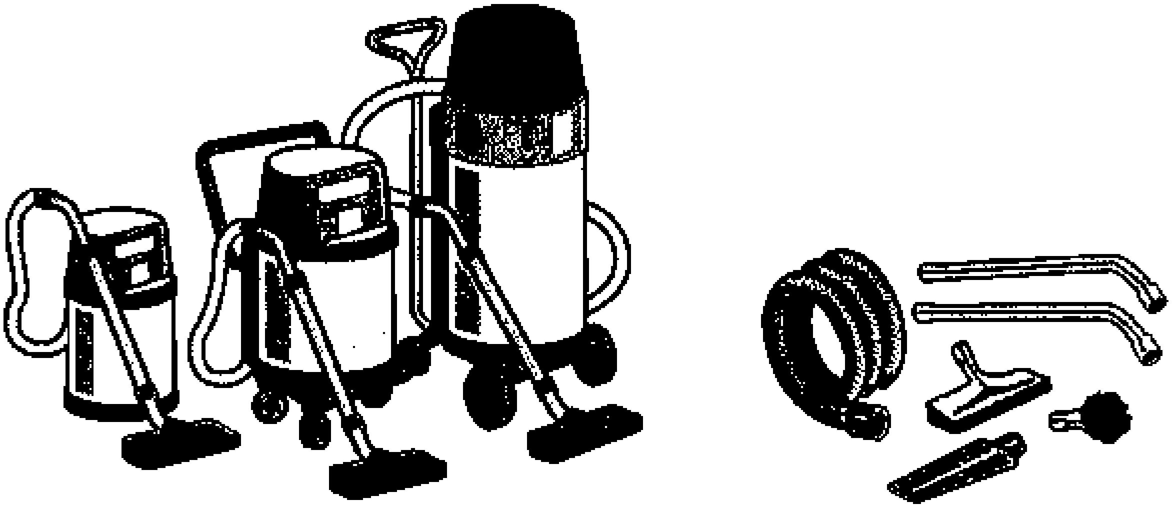


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

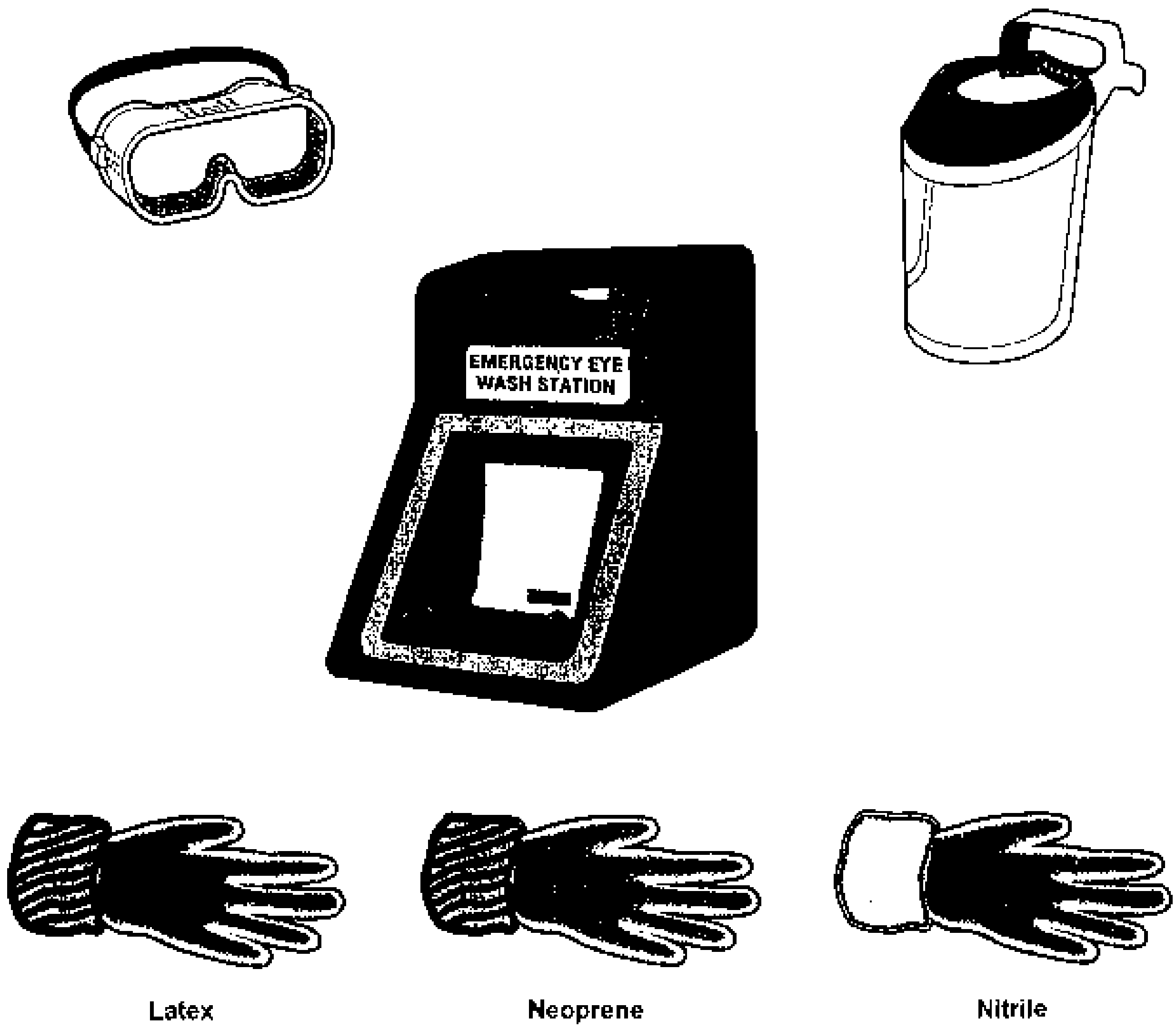
Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

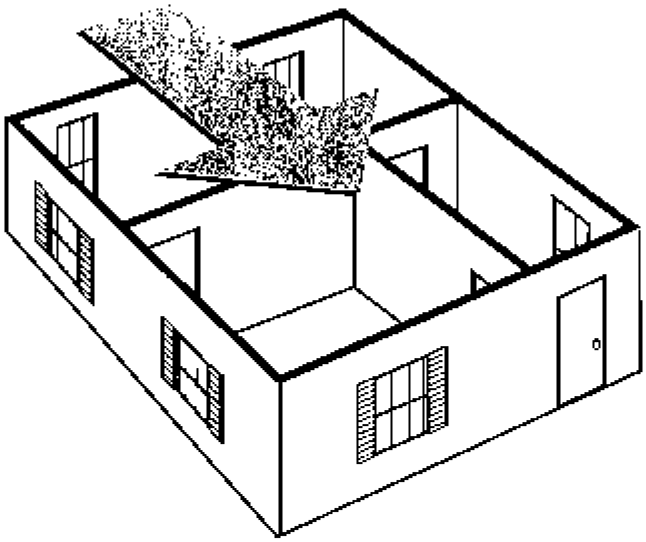
Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

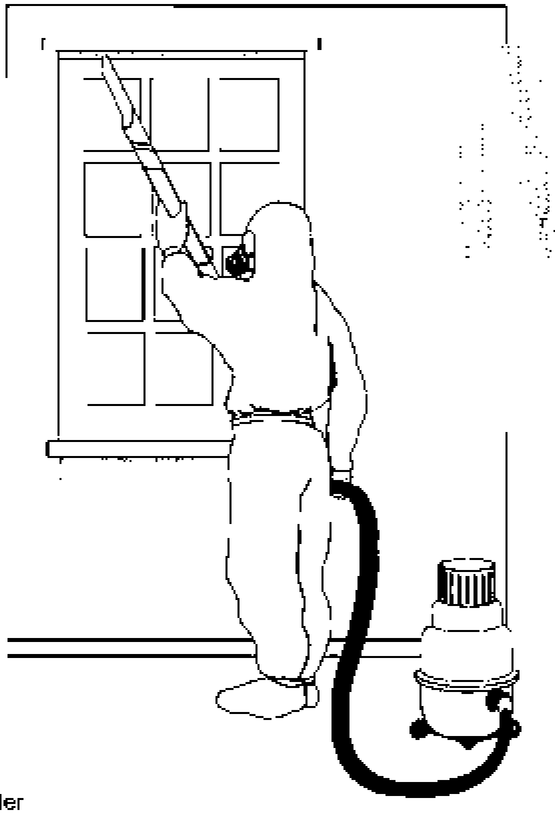
- First, the area is HEPA vacuumed.

Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on, and work down to the floor. Do every inch of the windows, especially the window troughs.



Courtesy: Alice Hamilton Occupational Health Center

- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

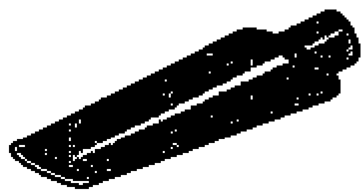
Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

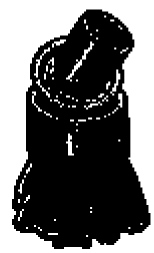
Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.

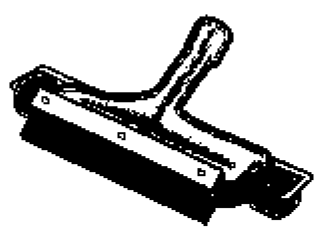


Rubber Cone



Dust Brush

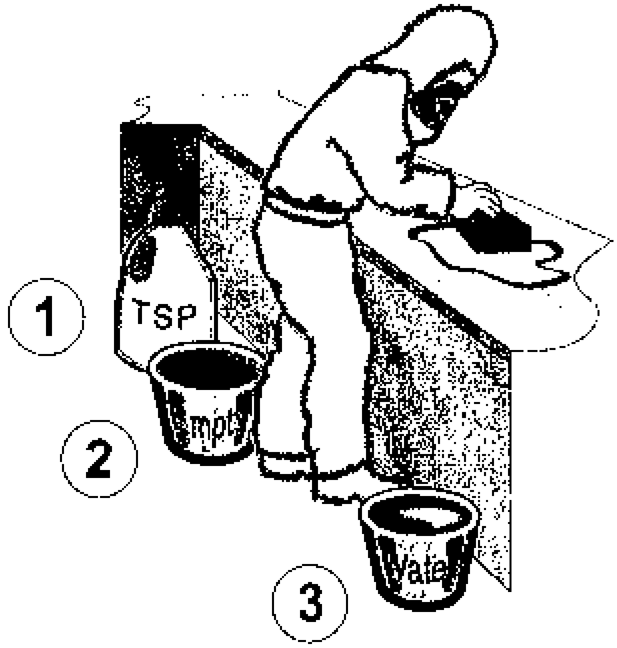
Powered Carpet Beater



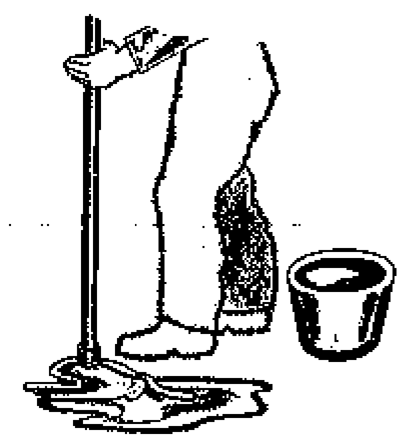
Wheeled Floor Nozzle

Figure 14.4c (continued)

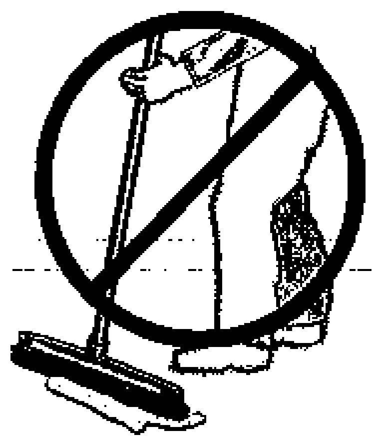
Wash all surfaces with suitable detergents
Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces



Wet Mop Floor



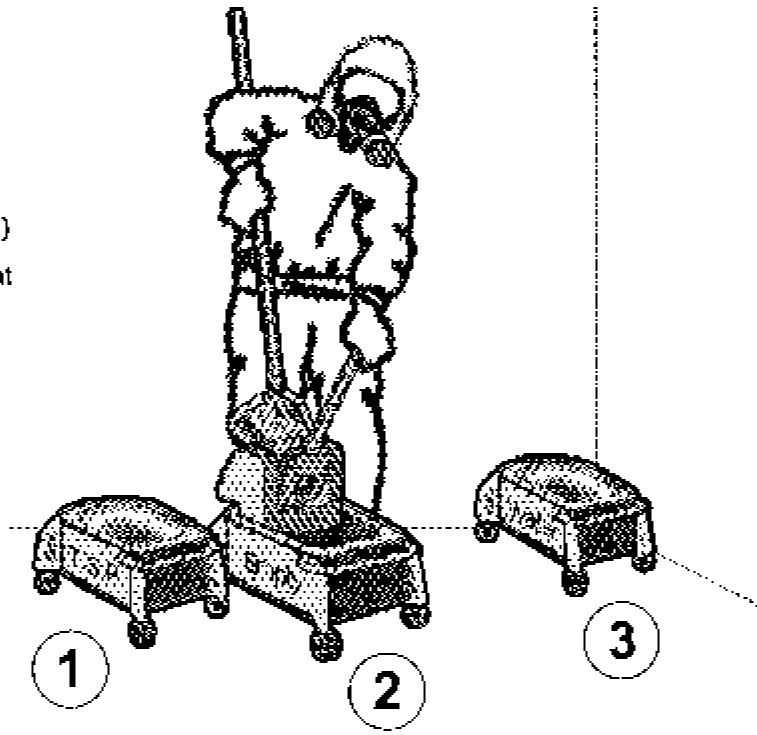
Don't Dry Sweep

Figure 14.4c (continued)

Use the 3-Bucket System.

To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.



Squeeze out the mophead in empty bucket #2. Return to bucket #1 for more detergent solution and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

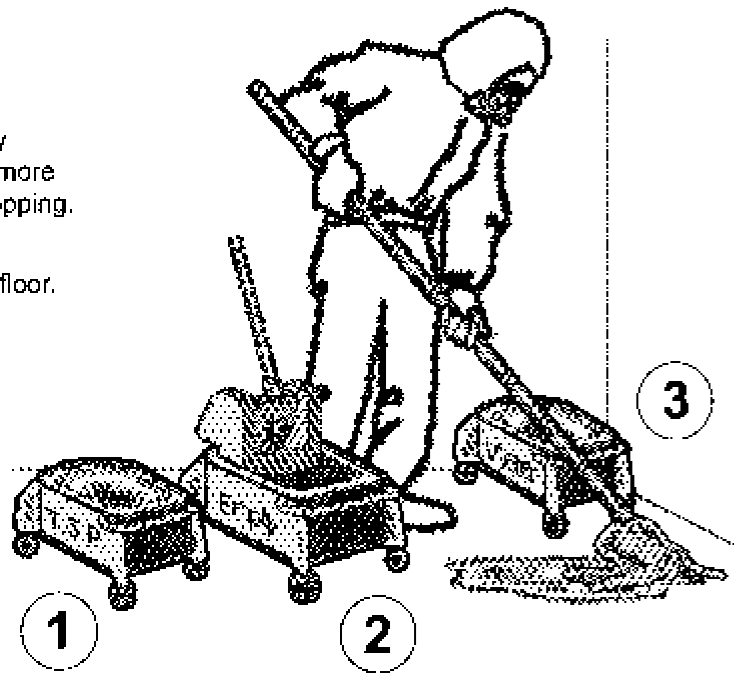


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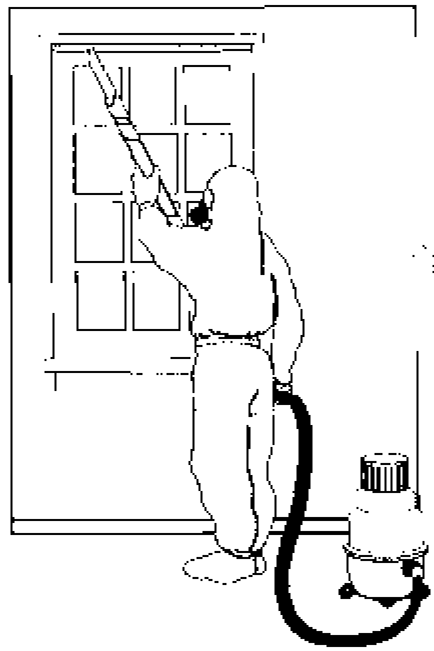
Figure 14.4d (continued)

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

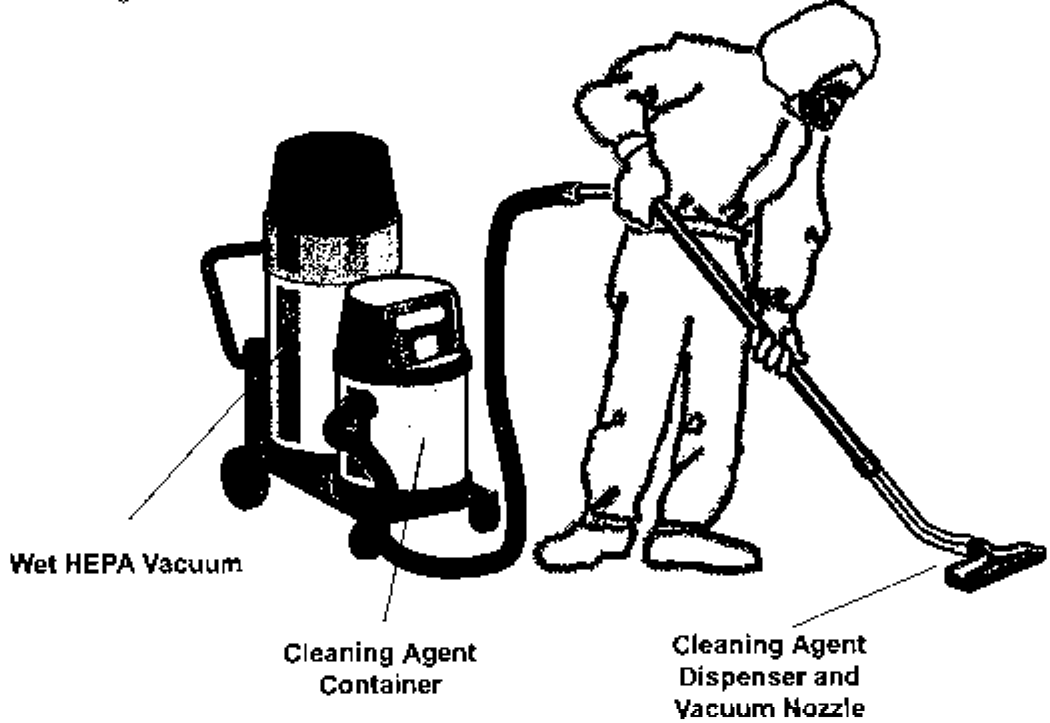
IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.



Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

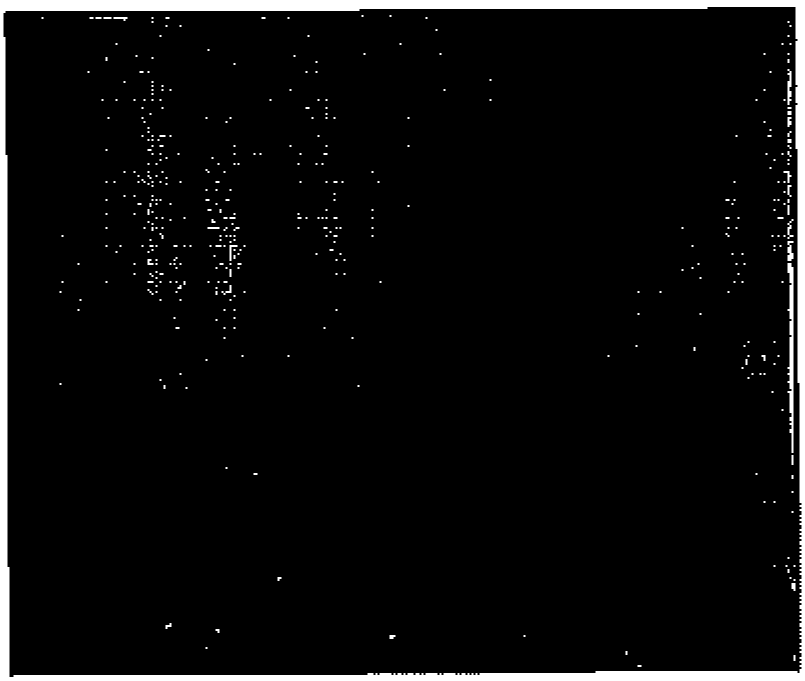


Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water *and cleaned*. All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

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the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).

Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This

option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dust-retaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table 14.1 Initial Cleaning Wipe-Test Failure Rates for Various Abatement Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)

and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993).

These *Guidelines* do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Cycle Number	Mass Removal Efficiency Percentages			
	Cleaning Method			
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.8	67.0	29.4
5	59.3	88.9	72.1	32.5
6	61.6	91.2	74.4	34.9
7	63.8	93.1	76.4	36.5
8	67.5	95.4	77.5	38.1
9	67.5	97.7	78.7	40.1
10	67.2	100.0	80.2	41.7
11		102.3	80.2	41.7
12		104.6	84.1	44.8
13		104.6	84.5	46.8
14		103.8	84.5	48.4
15				49.6
16				50.8
17				52.4
18				53.6
19				54.4
20				55.2

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) *Effectiveness of Clean-up Techniques for Leaded Paint Dust*

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APPENDIX F

MOLD GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

TG 277

FEBRUARY 2002

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

Concern about indoor exposure to mold has been increasing as the public becomes more aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions.

This document provides the best and most current guidance for remediation of clean water damage (<48 hours) and mold contamination (>48 hours) into one resourceful Army guide. This guide has been designed to provide information to facilities management individuals who have little or no experience with mold remediation. It will assist them in making a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to develop or evaluate an in-house remediation plan or evaluate a remediation plan submitted by an outside contractor. If an outside contractor is employed, they must have experience cleaning up mold. Check their references, and have them follow the recommendations presented in this document, EPA guidelines, and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). A multi-disciplinary team approach to mold concerns is best. A health and safety professional, such as an industrial hygienist, should be consulted prior to any remediation activities to assist in the project.

Molds produce tiny spores to reproduce. Mold spores float through the indoor and outdoor air continually. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or uncorrected. There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.(1)

In all situations, the underlying cause of water accumulation must be rectified or mold growth will recur. Any initial water infiltration should be stopped and clean up began immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth. (Refer to Appendix A for detailed guidance on clean water damage response). If the source of water is elevated humidity, actions to maintain the relative humidity levels below 60% to inhibit mold growth should be taken (2). Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilating, and air-conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide adequate drainage and slope the ground away from the foundation.

REMEDIATION PLANNING

- Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Select cleanup methods for moldy items (Appendix B)
- Select Personal Protection Equipment (PPE)- protect remediators (Appendix B)
- Select containment equipment - protect building occupants (Appendix B)
- Select remediation personnel who have the experience and training needed to implement the remediation plan and use PPE and containment as appropriate

REMEDIATE MOISTURE AND MOLD PROBLEMS

- Fix moisture problem, implement repair plan and/or maintenance plan
- Dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Clean and dry moldy materials (Appendix B)
- Discard moldy porous items that can't be cleaned (Appendix B)

REMEDIATION PROCEDURES

Four levels of abatement are described below. The size of the area impacted by mold contamination primarily determines the type of remediation. The sizing levels below are based on professional judgment and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of mold and preventing dust contaminated with mold from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement. The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. (3)

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be discarded if possible. All materials to be reused should be dry and visibly free from mold. Routine inspections should be conducted to confirm the effectiveness of remediation work. (1 and 3)

The use of bleach or other biocides is questionable in most cases (8). The effectiveness of bleach in reducing living mold is dependent on concentration, residual chlorine levels, and contact time on the surface (8). All of these factors are difficult to control during remediation. Removal of all mold growth can generally be accomplished by physical removal of materials supporting active growth and thorough cleaning of non-porous materials (4). Therefore, application of a biocide serves no purpose that could not be accomplished with a detergent or cleaning agent (4).

The use of gaseous ozone or chlorine dioxide for remedial purposes is **not** recommended. Both compounds are highly toxic and contamination of occupied space may pose a health threat. Furthermore, the effectiveness of these treatments is unproven. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."(4)

FOUR REMEDIATION LEVELS

[Adapted from NYCDOH Guidelines on Assessment and Remediation of Fungi in Indoor Environments (3) and EPA (1)]

Level I: Small Isolated Areas – Total surface area affected less than 10 square feet - e.g., ceiling tiles, small areas on walls. Refer to Appendix B for detailed guidance.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas used by remediation workers for egress should be cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Level II: Medium – Total Surface Area affected between 10 and 100 square feet - e.g., several wallboard panels. (See Appendix B for detailed guidance).

The following procedures *at a minimum* are recommended:

Refer to Appendix C for proper PPE selection. Limited or Full protection may be required depending on the situation.

Refer to Appendix D for Containment procedures.

The work area and areas directly adjacent should be covered with a single layer of 6 mil fire-retardant polyethylene sheet(s) and taped before remediation, to contain dust/debris.

Seal ventilation ducts/grills in the work area and areas directly adjacent with 6 mil polyethylene sheeting. Use an exhaust fan with a High Efficiency Particulate Air (HEPA) filter to generate negative pressurization.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and surrounding areas should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level III be followed.

Level III: Large Area – Total Surface Area affected greater than 100 square feet or potential for increased occupant or remediator exposure during remediation is estimated to be significant. (See Appendix B for detailed guidance).

The following procedures are recommended:

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from occupied spaces using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

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The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft^2) follow Level I guidance for PPE and containment and for a areas (>10 ft^2) follow Medium (Level II) or when greater than 100 ft^2 follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended (7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

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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

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.

3. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water Damage - Cleanup and Mold Prevention

Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£

Water-Damaged Material†	Actions
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours§	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans.
Ceiling tiles	• Discard and replace.
Cellulose insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	• Discard and replace.

Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling should be pried away from wall for drying

£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours. mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.

These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

† If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft²)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

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APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

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APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips

- Always maintain the containment area under negative pressure.
- Exhaust fans to outdoors and ensure that adequate makeup air is provided.
- If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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USACHPPM
Readiness thru Health

Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278

February 2002

USACHPPM

Readiness thru Health

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*[1] will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination[2].

Safety Tips While Investigating and Evaluating Mold and Moisture Problems[3]

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate[1].

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems[3].

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination[2].

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air[4]. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control[4]."

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program. For further mold assistance, contact USACHPPM, Industrial Hygiene Field Services Program, DSN 584-3118 or (410) 436-3118.

References

1. USACHPPM Technical Guide 277, *Army Facilities Management Information Document on Mold Remediation Issues,* February 2002.

2. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

3. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

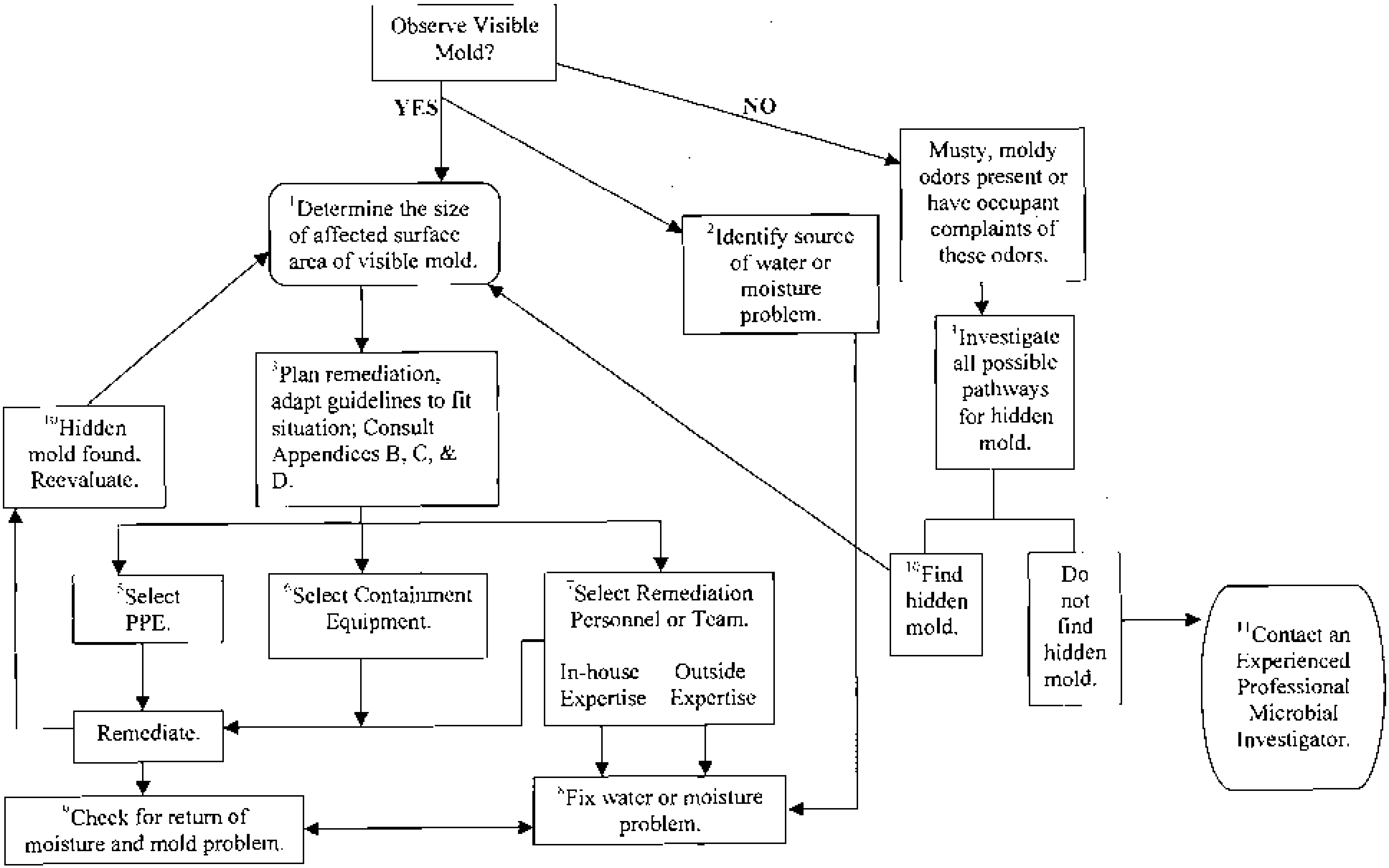
7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

MOLD INVESTIGATION DECISION LOGIC



MOLD INVESTIGATION DECISION LOGIC NOTES:

1. Roughly approximate the total surface area of visible mold. Categorization of the remediation levels are sometimes borderline, so when trying to decide the category to apply, consider the extent of visible growth, such as a heavy blanket of growth on the surface, to barely visible. If heavy growth is apparent, consider moving up to the next level of protection.

2. Do not skip this step. Address the source of water or moisture problem or the mold will simply reappear.

3. Always protect the health and safety of the building occupants and remediators.

4. Mold may be hiding on the backside of drywall, vinyl wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads. Check walls behind furniture, pipe chases and utility tunnels, porous thermal or acoustic liners inside ductwork, or check the rafters (due to roof leaks or insufficient insulation)[3].

5. Utilize appendices B and C for remediation guidance. Use your best judgment during investigations, if not disturbing the mold you may need minimal to no PPE. Do not alarm building occupants unnecessarily, but protect yourself as necessary.

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities[3]. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

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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

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.

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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.
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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 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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APPENDIX G

SITE MAPS

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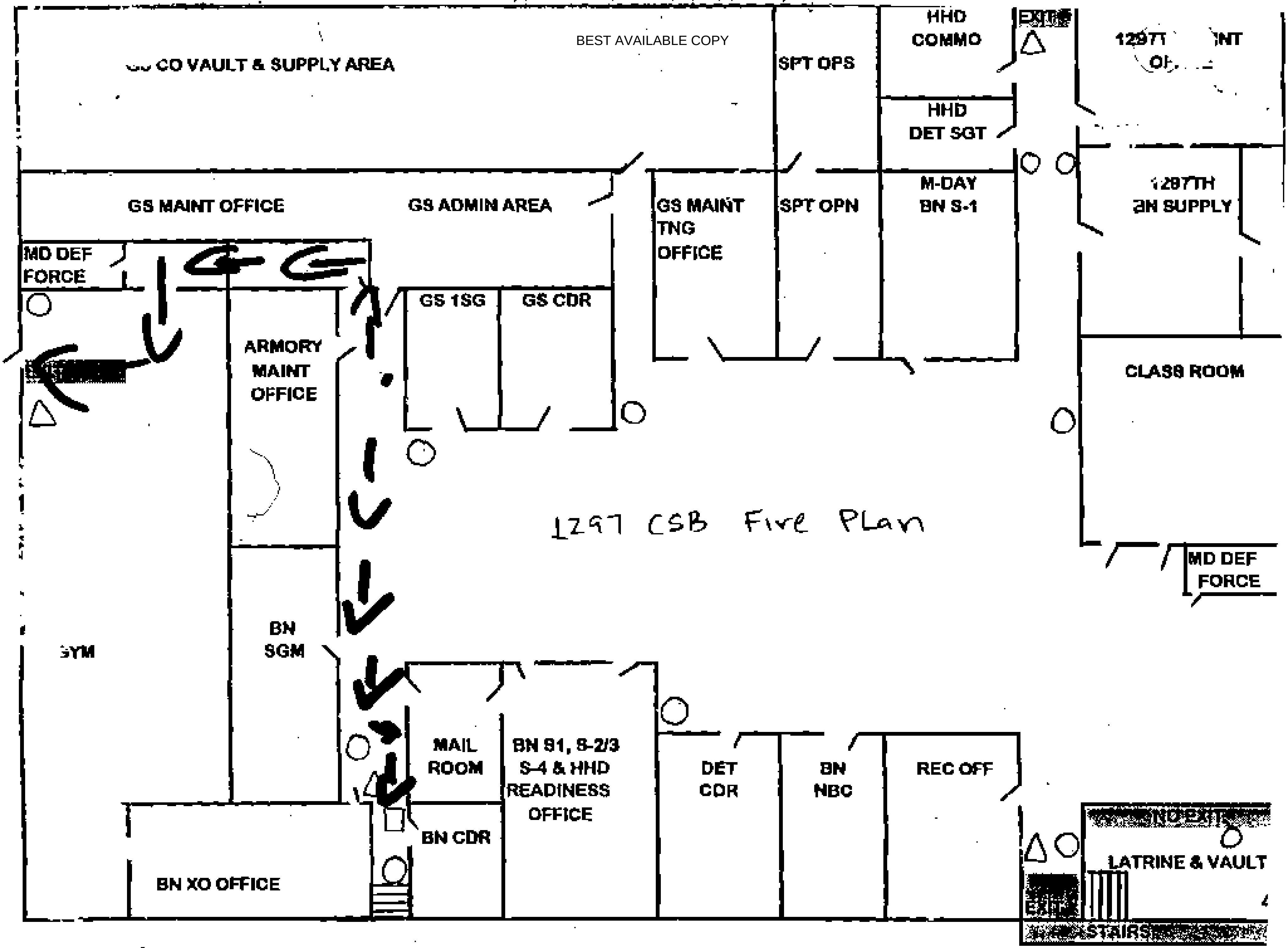

Δ = Alarm ○ = Extinguisher □ - MAIN Fire Box

May 01

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ANALYTICAL LABORATORY SERVICES, INC.

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Industrial Hygiene Survey

National Guard Facility
Havre de Grace Armory (Fred M. Coleman)
301 Old Bay Lane
Havre de Grace, MD 21078

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Havre de Grace Armory** **(Fred M. Coleman Armory)** **301 Old Bay Lane** **Havre de Grace, MD 21078**
Prepared By:	**Analytical Laboratory Services, Inc.** **3544 North Progress Avenue** **Suite 100** **Harrisburg, PA 17110**
Survey Date:	**August 19, 2010**
Report Date:	**September 21, 2010**
ALSI Project #:	**1008543**

Non-Responsive [redacted]

Director, Environmental Health & Safety

3544 North Progress Avenue ✦ Suite 100 ✦ Harrisburg, PA 17110
TEL: 717-540-3424 ✦ FAX: 717-540-3428

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Section 1.0
Executive Summary

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on August 19, 2010, at the Havre de Grace Armory located at 301 Old Bay Lane, Havre de Grace, MD 21078. The survey was performed by Ms. [redacted] This is also known as the Fred M. Coleman Armory.

1. Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft^2 in Room 124 on top of the heater. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2. The bulk sample of peeling paint collected from the drill hall was determined to be 3.8% lead by laboratory analysis. This is a significant amount of lead and may present a potential health hazard most notably in areas where paint in peeling and damaged. 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 124/126, 2) Room 105, 3) Room 206. Lighting should be improved in these areas.

3. Indoor air quality parameters of temperature, relative humidity carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment. Relative humidity exceeded the recommended ceiling of 60% and temperature was less than the recommended criteria of 73 degrees F in a few locations. Relative humidity should be maintained at 30-60%. Low relative humidity can lead to the drying of mucous tissues and an increased susceptibility to respiratory infection. High relative humidity can provide an environment suitable for microbial growth and proliferation.

4. The steam pipe under the wooden floor is not properly insulated which causes steam to come through the floor. This provides a source of moisture which can provide an environment suitable for microbial growth and proliferation as well as a safety hazard. We recommend that the steam pipes be inspected by a qualified professional and appropriate action be taken to eliminate the source of moisture. If fungal growth is present it should be properly remediated. The safety hazard is present due to the deterioration of the wooden flooring. In Room 100 & 117 the floors are broken through (see photo). Damaged areas of flooring should be repaired in conjunction with the steam line insulation repair and potential fungal growth remediation.

5. Water damaged ceilings and active roof leaks are present. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

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Section 2.0
Operation Description & Observations

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Section 2.0 Operation Description & Observations

The Havre de Grace Armory is mainly an administrative facility with many offices, training and storage areas. There were approximately 30 full-time employees stationed at this facility at the time of this survey.

The building was initially constructed in the early 1900's. It was originally the clubhouse at a horse track. There have been several renovations throughout the years. The exterior is wood siding. The interior walls are primarily block, plaster, or drywall. The floors are wood with some vinyl floor tile.

The heating, ventilating, and air conditioning system (HVAC) consisted of central air-conditioning in newer areas of the building supplemented by window air-conditioners in older areas of the building. There are three air handlers. Outdoor air ventilation occurs via the HVAC system in areas where the system is present. 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. Filters were removed and inspected. There was some accumulation of dirt present on filters as would be expected. Portions of the units that could be observed were clean and appeared in good condition.

There is an old firing range in the building. It was closed in the 1970's and has been fully abated. It is now an office area. There is no child-care facility in the building.

Overall housekeeping was good. Areas were clean and well kept.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared properly designed. Personnel had supportive chairs.

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Section 3.0
Noise Survey

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Section 3.0 Noise Survey

Employees were not performing tasks that provided excessive noise levels. Therefore, noise exposure monitoring was not conducted.

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Section 4.0
Lead Testing

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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/m^3	Surface ug/ft^2	Paint Chip %Pb
1	Room 100	<4.2		
2	Drill Hall	<4.3		
3	Blank	<3 (ug)		
4	Converted Firing Range – Room 114 Floor		<110	
5	Converted Firing Range – Room 115 Desktop		<110	
6	Converted Firing Range – Room 116 AV Vent		<110	
7	Floor Outside Converted Firing Range		<110	
8	Room 122 – Top of Filing Cabinet		<110	
9	Room 124 – Top of Heater		**220**	
10	Main Lobby – Floor		<110	
11	Room 111 – Desktop		<110	
12	Room 107 – Top of Heater		<110	
13	Hallway Floor Outside Room 105		<110	
14	Kitchen Top of Food Storage Shelf		<110	
15	Drill Hall - Floor		<110	
16	Drill Hall – Fireplace Mantle		<110	
17	Drill Hall – Dining Area Top of Bar		<110	
18	Room 206 – Tabletop		<110	
19	Blank		<12 (ug)	
20	Drill Hall Wall			**3.8**
Criteria		**50**	**200**	**0.5**

Key: **Bolded** results exceed listed criteria

Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft^2 in Room 124 on top of heater.

The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for Environmental Chemicals," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 ug/m^3. In fact, no detectable level of lead was identified in the air samples collected.

Deteriorated paint was observed in a many 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 peeling paint in the Drill Hall. This paint was found to be 3.8% lead. This is above the HUD definition of lead-based paint (0.5%).

Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2. The bulk sample of peeling paint collected from the drill hall was determined to be 3.8% lead by laboratory analysis. This is a significant amount of lead and may present a potential health hazard most notably in areas where paint in peeling and damaged. Peeling and damaged paint should be repaired and properly remediated.

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Section 5.0
Lighting

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Section 5.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. K070003). The light meter was last calibrated on November 26, 2009. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Room 123	46.3	30-50	Yes
Room 124/126	**26.0**	30-50	No
Room 122B	40.1	30-50	Yes
Room 113	48.3	30-50	Yes
Room 112	41.5	30-50	Yes
Room 117	87.0	30-50	Yes
Room 107	59.6	30-50	Yes
Room 105	**17.0**	30-50	No
Room 206	**25.0**	30-50	No
Room 204	35.0	30-50	Yes
Drill/Mess Hall	43.0	30-50	Yes
Dining Area	18.0	10	Yes

Lighting levels met the minimum recommended guidelines in all but the following areas: 1) Room 124/126, 2) Room 105, 3) Room 206. Lighting should be improved in these areas.

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Section 6.0
Indoor Air Quality

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Section 6.0 Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7565X (Serial # 0839020). The IAQ Meter was last calibrated in March 2010.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2007). ASHRAE specifies temperature and relative humidity ranges for human comfort (ASHRAE 55-2004). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60% in occupied areas.

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 69.2 to 76.2 degrees F with relative humidity readings ranging from 54.7% to 73.5%. During the survey, carbon dioxide (CO_2) levels ranged from 432 ppm to 564 ppm within the facility compared to an outdoor CO_2 level of 332 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,032 ppm (332 ppm + 700 ppm). Carbon monoxide (CO) ranged from 0.0 – 0.1 ppm.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	77.2	72.0	341	0.0
Room 123	76.2	56.0	462	0.0
Room 124/126	75.5	58.0	451	0.1
Room 122B	75.3	55.9	474	0.1
Room 113	75.2	55.5	459	0.0
Room 112	**69.2**	55.1	478	0.1
Room 117	**71.5**	**62.3**	464	0.0
Room 107	71.7	**73.5**	564	0.0
Room 105	**70.0**	54.7	446	0.0
Room 206	**70.6**	59.2	431	0.0
Room 204	**71.7**	**70.0**	508	0.0
Drill/Mess Hall	73.1	59.7	448	0.0
Dining Area	74.0	58.2	432	0.0
Outdoors	78.7	63.9	323	0.0
Criteria	**73.0-79.0**	**30-60**	**<1,032**	**<9.0**

Key: **Bolded** results exceed listed criteria

Relative humidity exceeded the recommended ceiling of 60% and temperature was less than the recommended criteria of 73 degrees F in some locations. There is central air conditioning system in newer areas of the building and window air-conditioners in other areas. 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.

Carbon dioxide levels did not exceed the recommended ceiling of 1,032 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.

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. There is a musty odor throughout the building.

2. There is a steam pipe under the wooden floor. It is not properly insulated which causes steam to come through the floor. This provides a source of moisture which can provide an environment suitable for microbial growth and proliferation as well as a safety hazard. We recommend that the steam pipes be inspected by a qualified professional and appropriate action be taken to eliminate the source of moisture. If fungal growth is present it should be properly remediated. The safety hazard is present due to the deterioration of the wooden flooring. In Room 100 & 117 the floors are broken through (see photo). Damaged areas of flooring should be repaired in conjunction with the steam line insulation repair and potential fungal growth remediation.

3. Water damaged ceilings and active roof leaks are present. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

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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 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 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:

1. Ceiling tile in kitchen are suspect ACM. All are in good condition.

2. 12" x 12" vinyl floor tile and mastic was observed in the facility. This was in good condition except for a few areas with water damage.

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Section 8.0
Maintenance Bay

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Section 8.0 Maintenance Bay

There is no garage area at this facility.

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Section 9.0
Limitations

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Section 9.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Analytical Laboratory Services, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A
Laboratory Analysis Report

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

AIHA LAP, LLC ACCREDITED LABORATORY

LAB #100470

NY ELAP 10920

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	Fred M. Coleman Armory	**Chain Of Custody:**	508631
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Havre de Grace, MD	**Date Submitted:**	8/24/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Fred M. Coleman Armory	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	8/31/2010 **Report Date:** 9/1/2010

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
1073234	1008543-1	Flame	Air	715	N/A	4.2	ug/m³	<3	<4.2	ug/m³	
1073235	1008543-2	Flame	Air	700	N/A	4.3	ug/m³	<3	<4.3	ug/m³	
1073236	1008543-3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1073237	1008543-20	Flame	Paint Chip	****	N/A	0.0082	%Pb		3.8	%Pb	
1073238	1008543-4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1073239	1008543-5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1073240	1008543-6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1073241	1008543-7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1073242	1008543-8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1073243	1008543-9	Flame	Wipe	****	0.108	110	ug/ft²	24	220	ug/ft²	
1073244	1008543-10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1073245	1008543-11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1073246	1008543-12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1073247	1008543-13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1073248	1008543-14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1073249	1008543-15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1073250	1008543-16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1073251	1008543-17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1073252	1008543-18	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP
10920

Client:	National Guard Bureau	**Job Name:**	Fred M. Coleman Armory	**Chain Of Custody:**	508631
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Havre de Grace, MD	**Date Submitted:**	8/24/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Fred M. Coleman Armory	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	8/31/2010
				Report Date:	9/1/2010

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments
1073253	1008543-19	Flame	Wipe Blank	****	N/A	12 ug		<12 ug	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)
%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results.

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accreditation applies only to paint chip, wipe, and soil samples.

Lom Butnik
Analyst: Lom Butnik

G Edward Carney
Technical Manager: G Edward Carney

Page 1 of 2

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AMA Analytical Services, Inc.
Focused on Results www.amalab.com
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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **508631**

Pg 1 of 2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-H Old Bay Lane
3. Address 2: Attn: NGB-AVN-SL State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Fred M. Coleman Armory
2. Job Location: Havre de Grace, MD
3. Job #: Fred M. Coleman Armory P.O. #: W912K6-09-A-0003
4. Contact Person [redacted]
5. Submitted by: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day + Date Due: 8/31/10 ☐ Results Required By Noon (Every Attempt Will Be Made to Accommodate)	☒ Include COC/Field Data Sheets with Report ☒ Email [redacted] amalab.com ☐ Fax [redacted] us.army.mil ☐ Verbal [redacted] us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
- ☐ NIOSH 7400 ____ (QTY)
- ☐ Fiberglass ____ (QTY)

TEM Air – Please Indicate Filter Type:
- ☐ AHERA ____ (QTY)
- ☐ NIOSH 7402 ____ (QTY)
- ☐ Other (specify ____) ____ (QTY)

PLM Bulk
- ☐ EPA 600 – Visual Estimate ____ (QTY)
- ☐ EPA Point Count ____ (QTY)
- ☐ NY State Friable 198.1 ____ (QTY)
- ☐ Grav. Reduction ELAP 198.6 ____ (QTY)
- ☐ Other (specify ____) ____ (QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
- ☐ ELAP 198.4/Chatfield ____ (QTY)
- ☐ NY State PLM/TEM ____ (QTY)
- ☐ Residual Ash ____ (QTY)

TEM Dust
- ☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
- ☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
- ☐ Quan. (s/area) Dust D6480-99 ____ (QTY)

TEM Water
- ☐ Qual. (pres/abs) ____ (QTY)
- ☐ ELAP 198.2/EPA 100.2 ____ (QTY)
- ☐ EPA 100.1 ____ (QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
- ☒ Pb Paint Chip 1 (QTY)
- ☒ Pb Dust Wipe (wipe type Ghost) 1 ~~1~~ 10 (QTY)
- ☒ Pb Air 3 (QTY)
- ☐ Pb Soil/Solid ____ (QTY)
- ☐ Pb TCLP ____ (QTY)
- ☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
- ☐ Spore-Trap ____ (QTY)
- ☐ Surface Swab ____ (QTY)
- ☐ Surface Tape ____ (QTY)
- ☐ Other (Specify ____) ____ (QTY)
- ☐ Surface Vacuum Dust ____ (QTY)
- ☐ Culturable ID Genus (Media ____) ____ (QTY)
- ☐ Culturable ID Species (Media ____) ____ (QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER	SOIL	WIPE	TAPE	SWAB
1008543-1	Rm 100	8/19	714.82					X		X							
1008543-2	Drill Hall		770.35					X		X							
1008543-3	Blank		0					X		X							
1008543-4	Rm 114 Fl			100cm²				X				X					
1008543-5	Rm 115 Desktop							X				X					
1008543-6	Rm 116 AC Vent							X				X					
1008543-7	Fl Outside Firing Range							X				X					
1008543-8	Rm 108 Filing Cabinet							X				X					
1008543-9	Rm 124 Heater							X				X					
1008543-10	Main Lobby Fl							X				X					
1008543-11	Rm 111 Desktop							X				X					
1008543-12	Rm 107 Heater							X				X					

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 8 / 24 / 10 @ 1400 Via: USPS By (Print): Chris Nicodemus Sign: Chris Nicodemus
2. Date/Time Analyzed: / / @ By (Print): Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

2

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CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

Mailing/Billing Information:
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2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Fred M. Coleman Armory
2. Job Location: Havre de Grace MD
3. Job #: Fred M. Coleman Armory P.O. #: W912K6-09-A-0003
4. Contact Pers[redacted] @ phone #: (410) 942-0273
5. Submitted by: [redacted] Signature:

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☐ 5 Day + Date Due: ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ Include COC/Field Data Sheets with Report ☒ Email [redacted] @us.army.mil ☐ Fax ☐ Verb [redacted] @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM __(Qual) PLM __(Quan) PLM/TEM __(Qual) PLM/TEM __(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area) Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☐ Pb Dust Wipe (wipe type ____) ____ (QTY)
☐ Pb Air ____ (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WIPE/OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
1008543-13	Hall Fl Outside R&R	5/19		100 cm²				X				X					Date/Time: Contact: By:
1008543-14	Kitchen-Storage Shelf							X				X					
1008543-15	Drill Hall - Fl							X				X					
1008543-16	Drill Hall - [illegible]							X				X					
1008543-17	Drill Hall Dining Area Fan							X				X					Date/Time: Contact: By:
1008543-18	Rm 206 Tabletop							X				X					
1008543-19	Blank			0 cm²				X				X					
1008543-20	Drill Hall Wall							X			X						
																	Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: ____ / ____ / ____ @ ____ Via: ____ By (Print): ____ Sign: ____
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ____ / ____ / ____ Time: ____ Initials: ____
4. Comments: ____

2

Appendix B
Photographs

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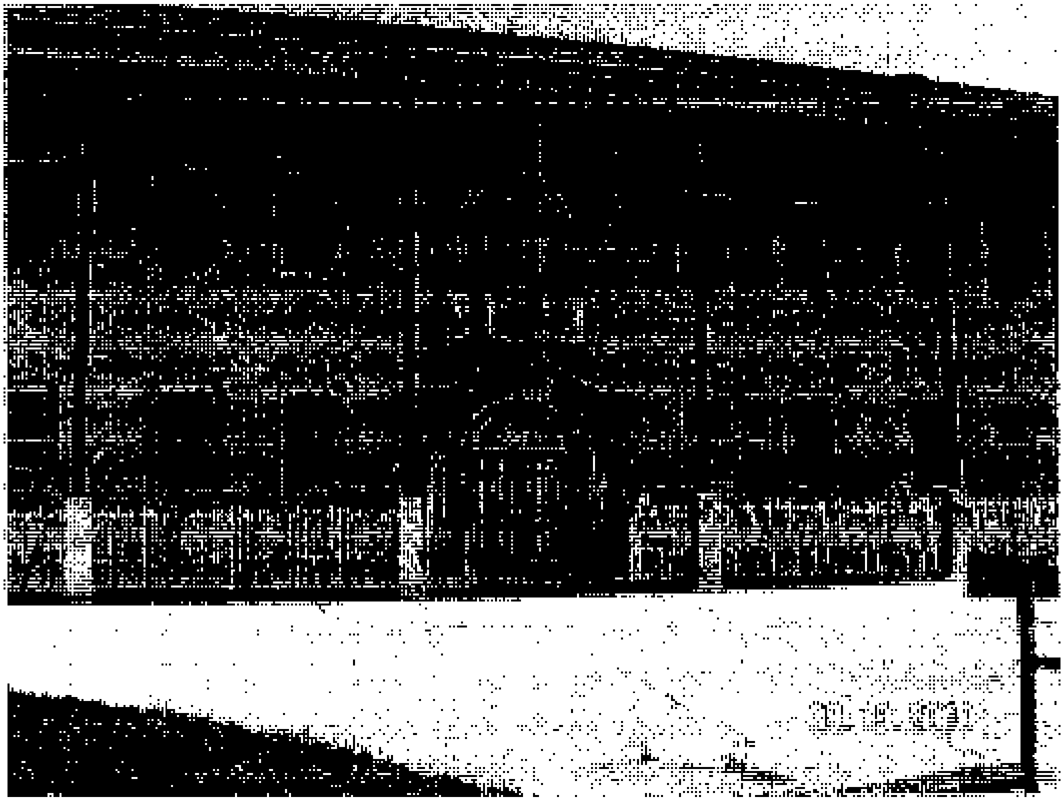

Photo 1: Exterior view

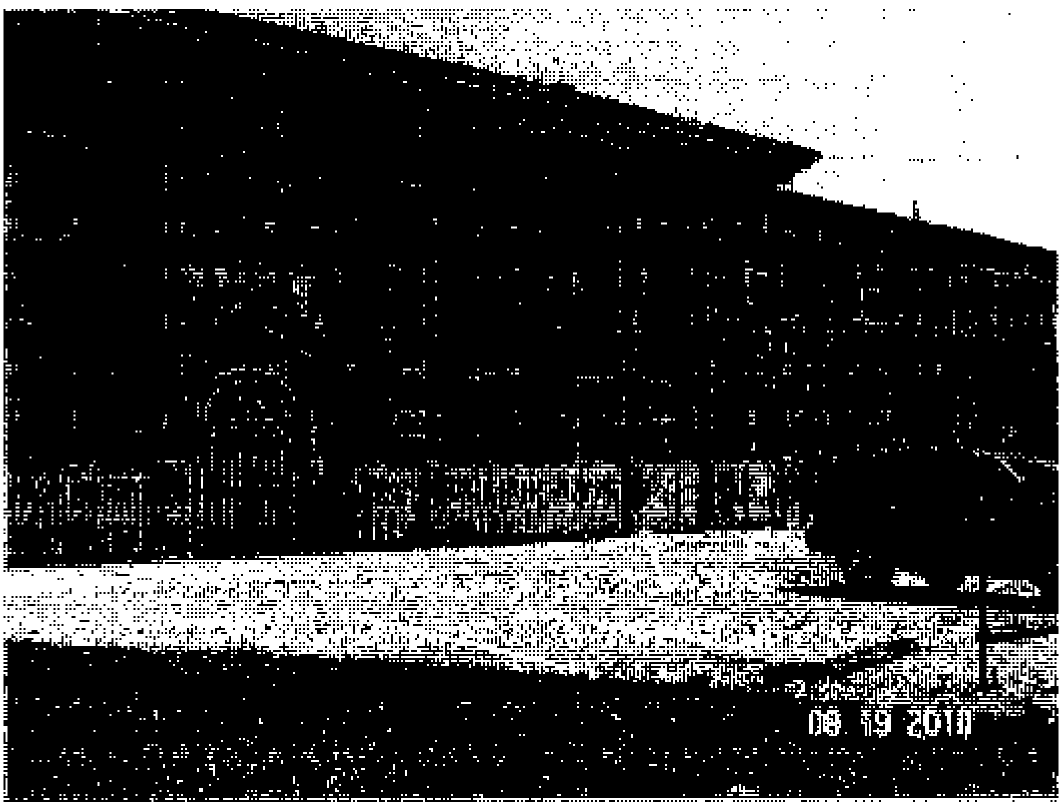

Photo 2: Exterior view

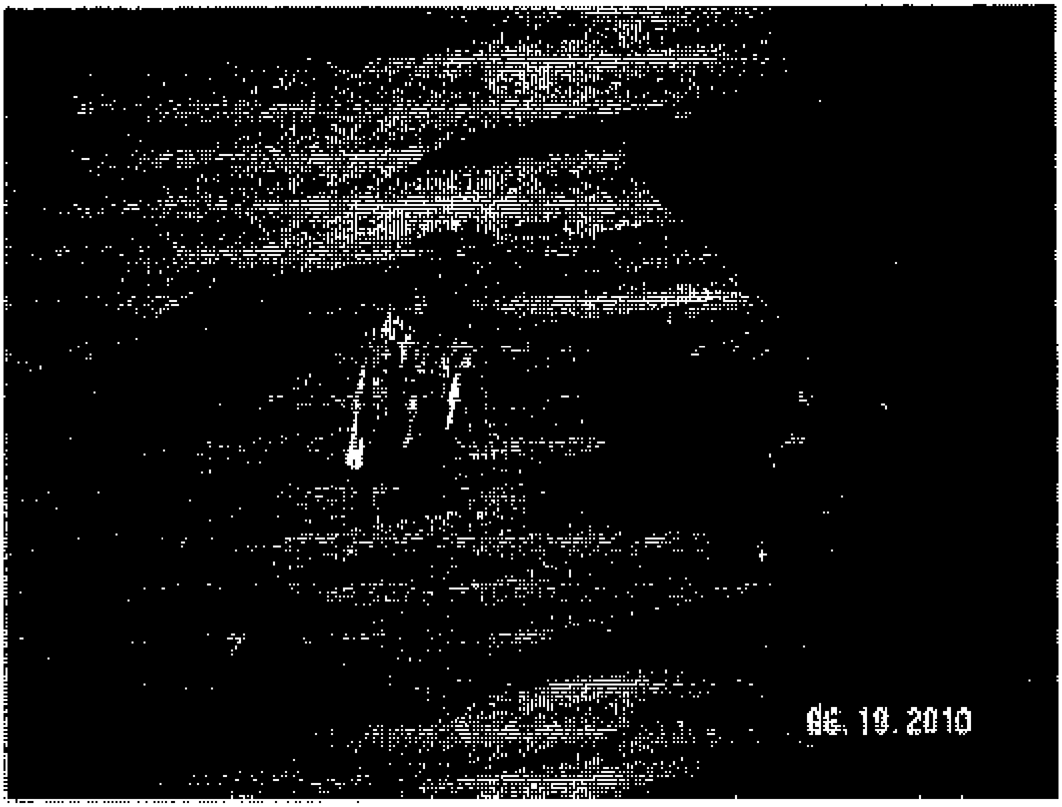

Photo 3: First floor, Rm. 100; broken flooring

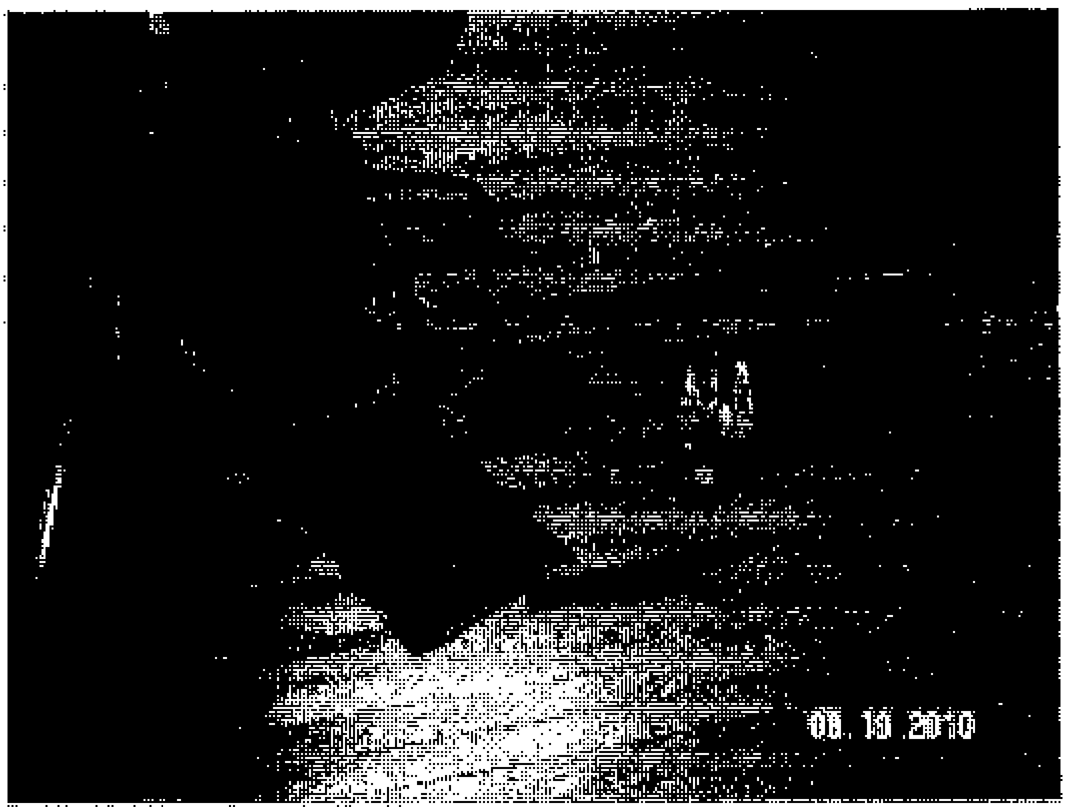

Photo 4: First floor, Rm. 100; broken flooring

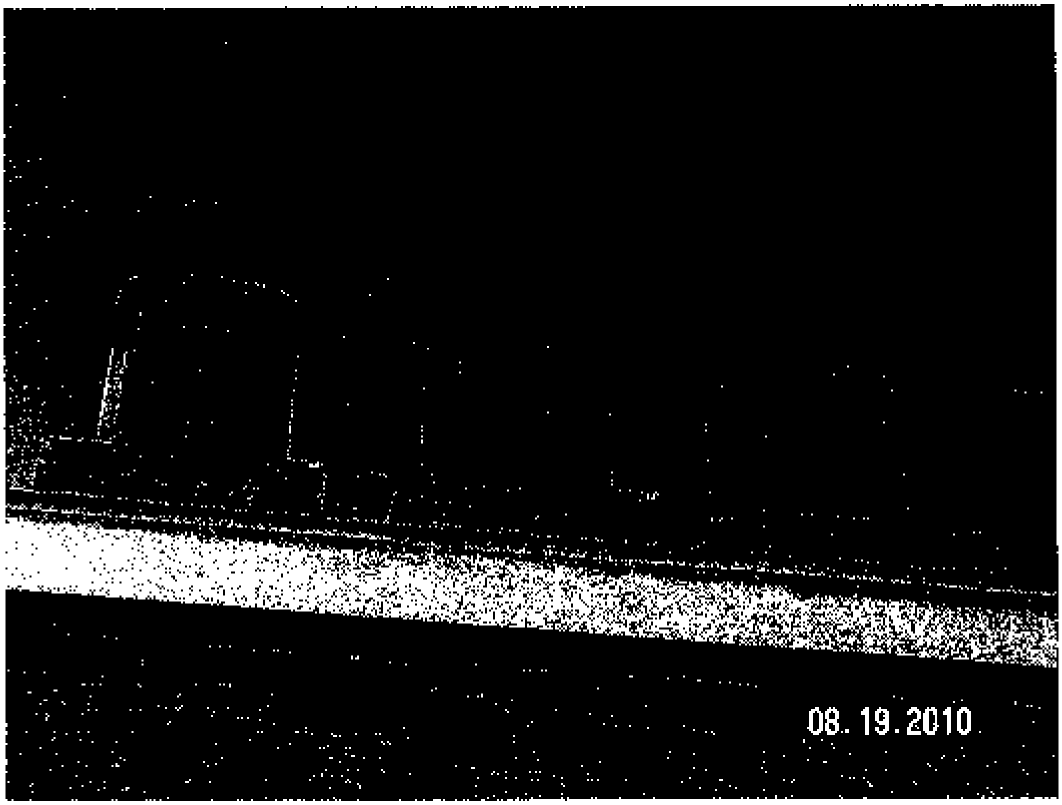

Photo 5: AC condensers, outside

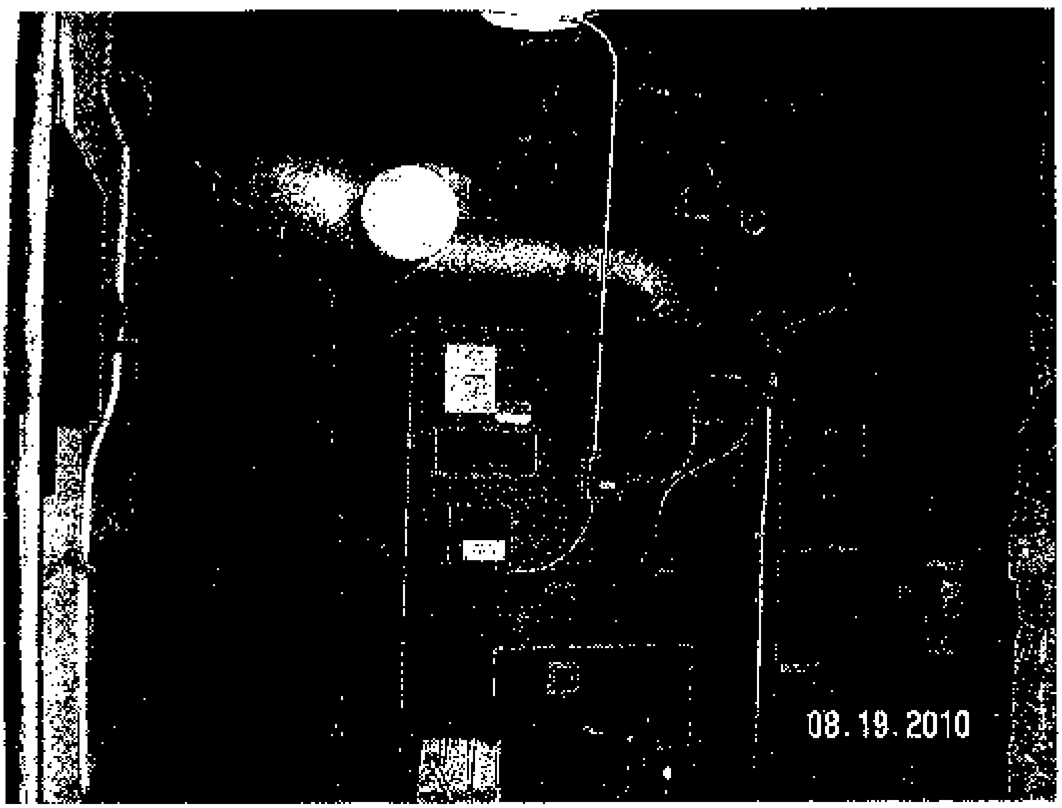

Photo 6: Boiler

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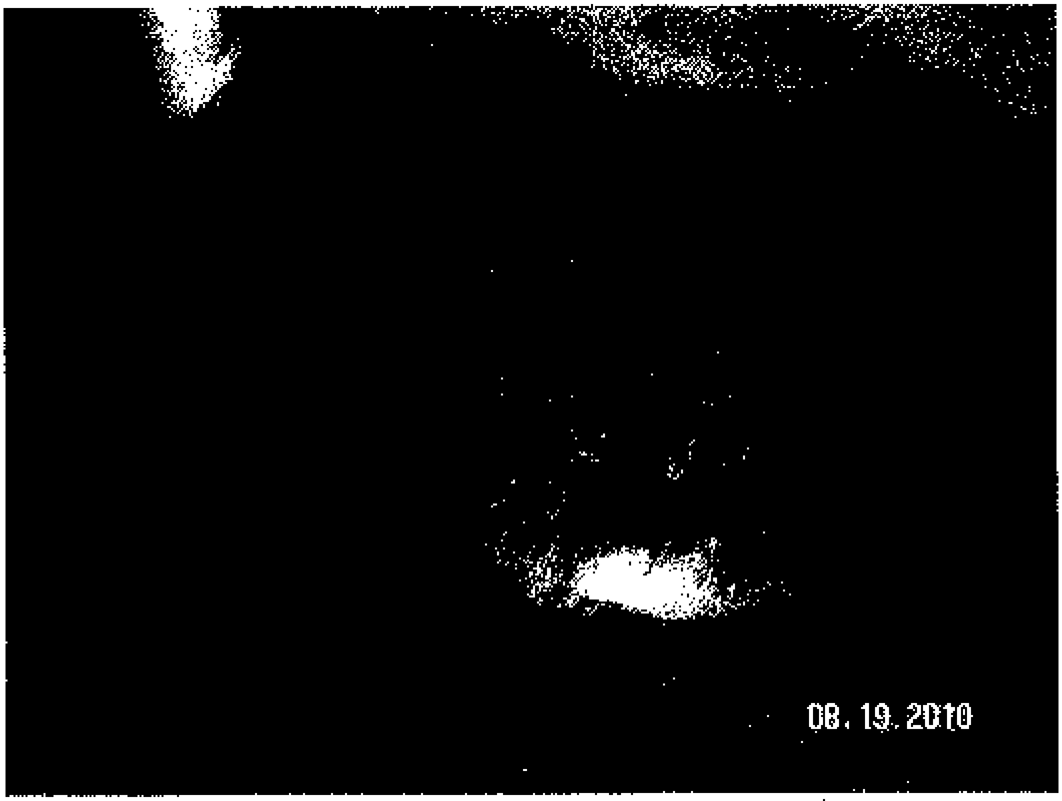


Photo 7: Crawl space; standing water from leak in hot water tank

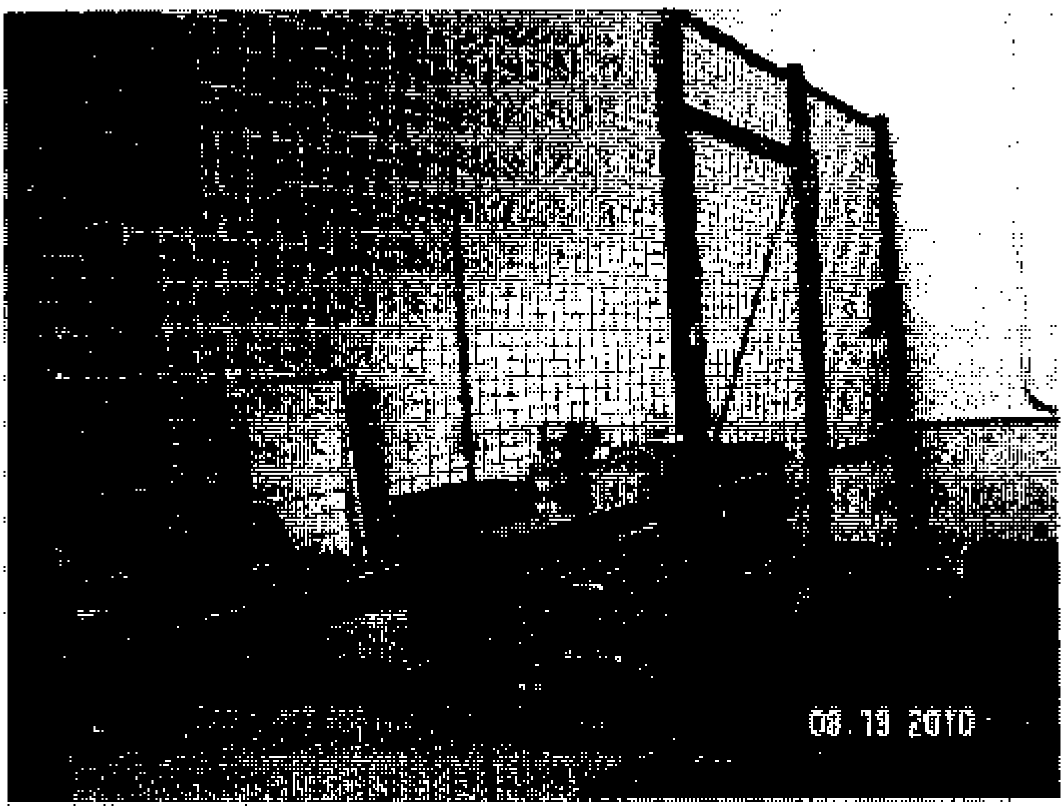


Photo 8: Converted Firing range, now offices

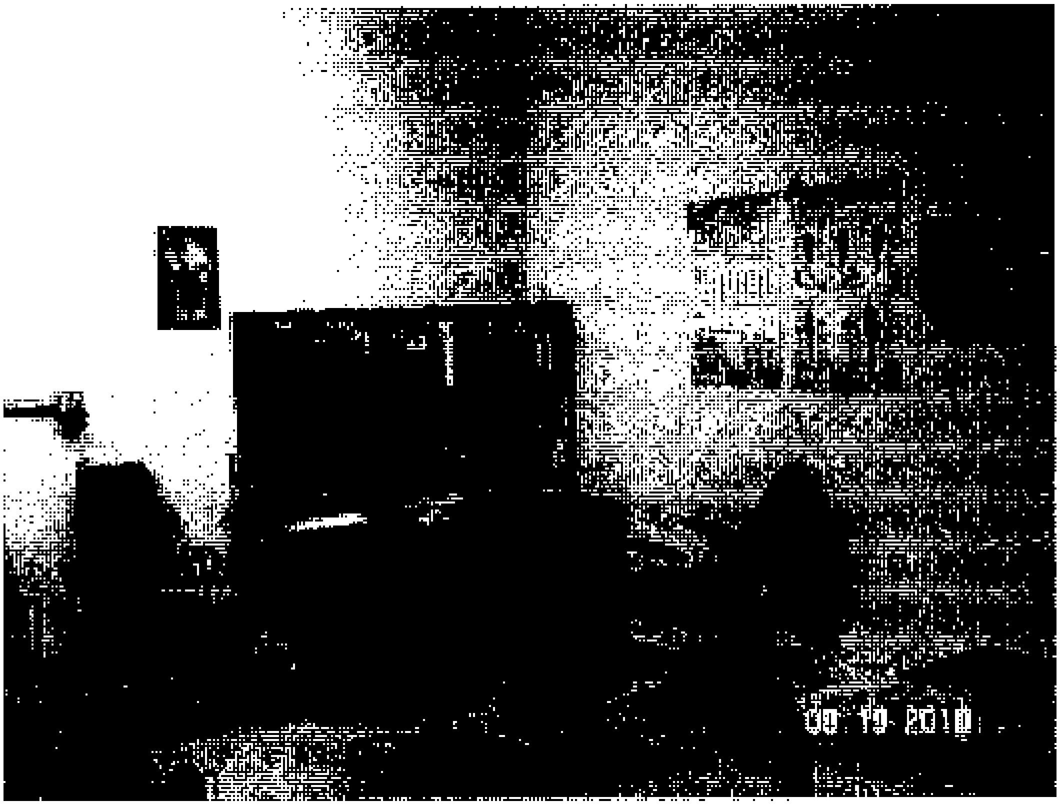
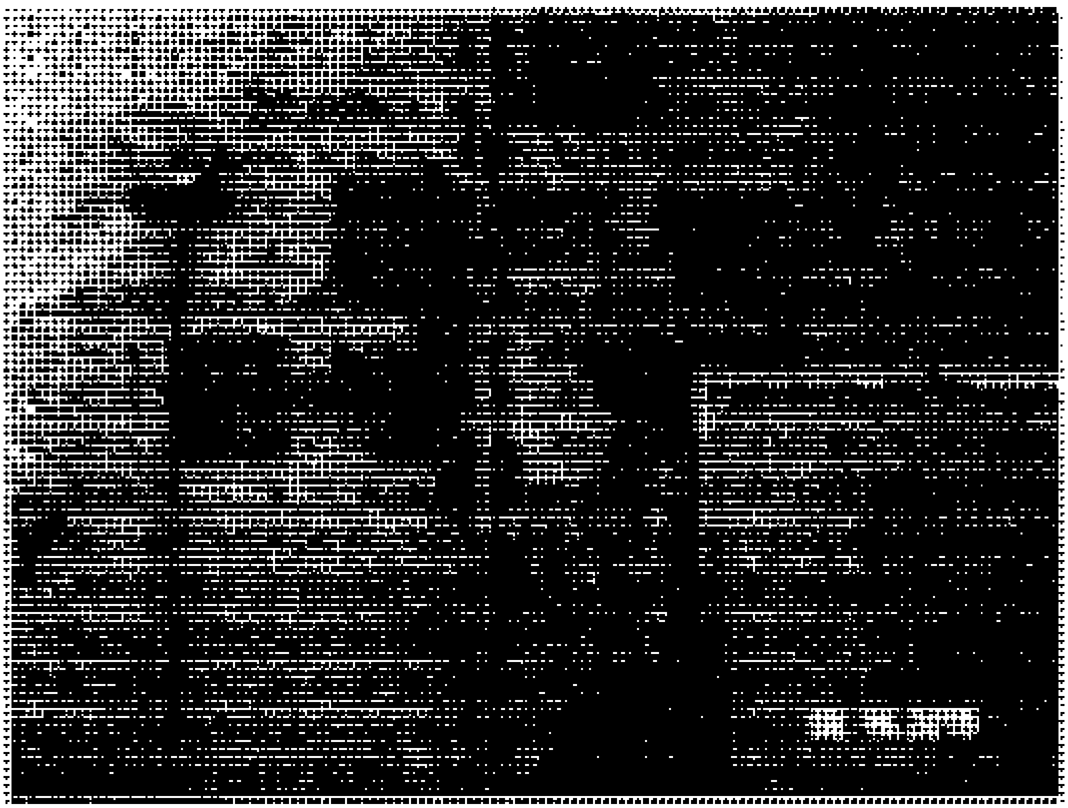


Photo 9: Converted firing range, now offices



BEST AVAILABLE COPY

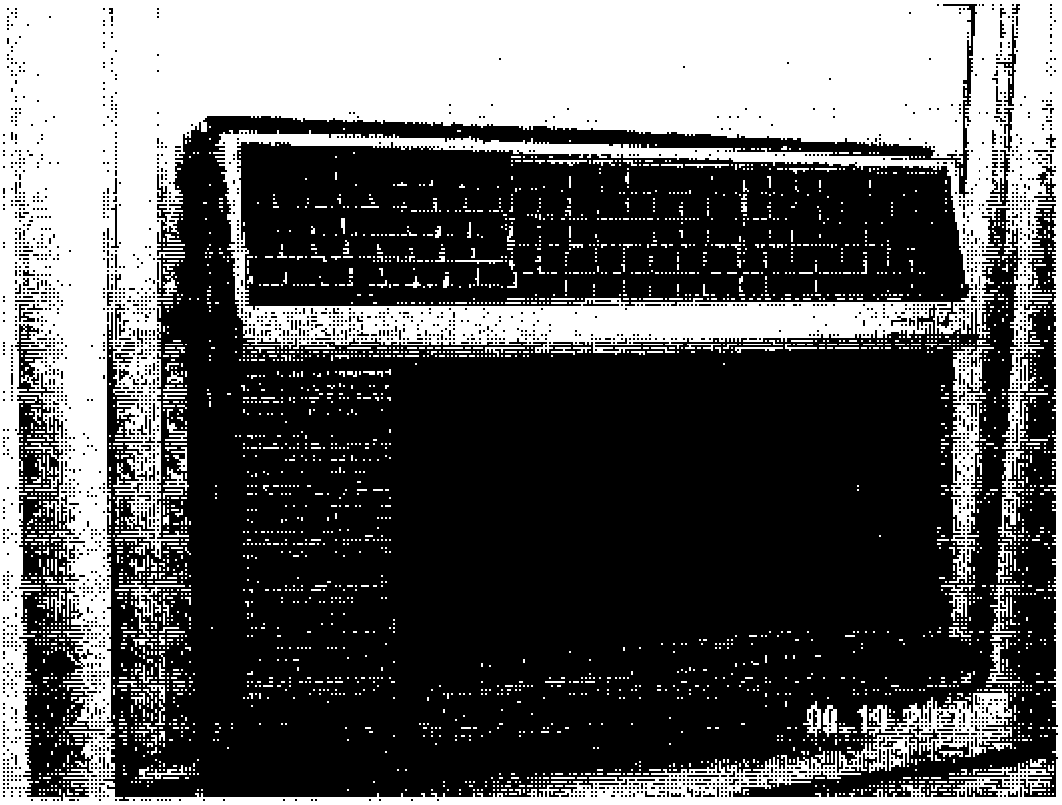


Photo 11: Room 107: window AC, missing front (odor and high humidity in room)

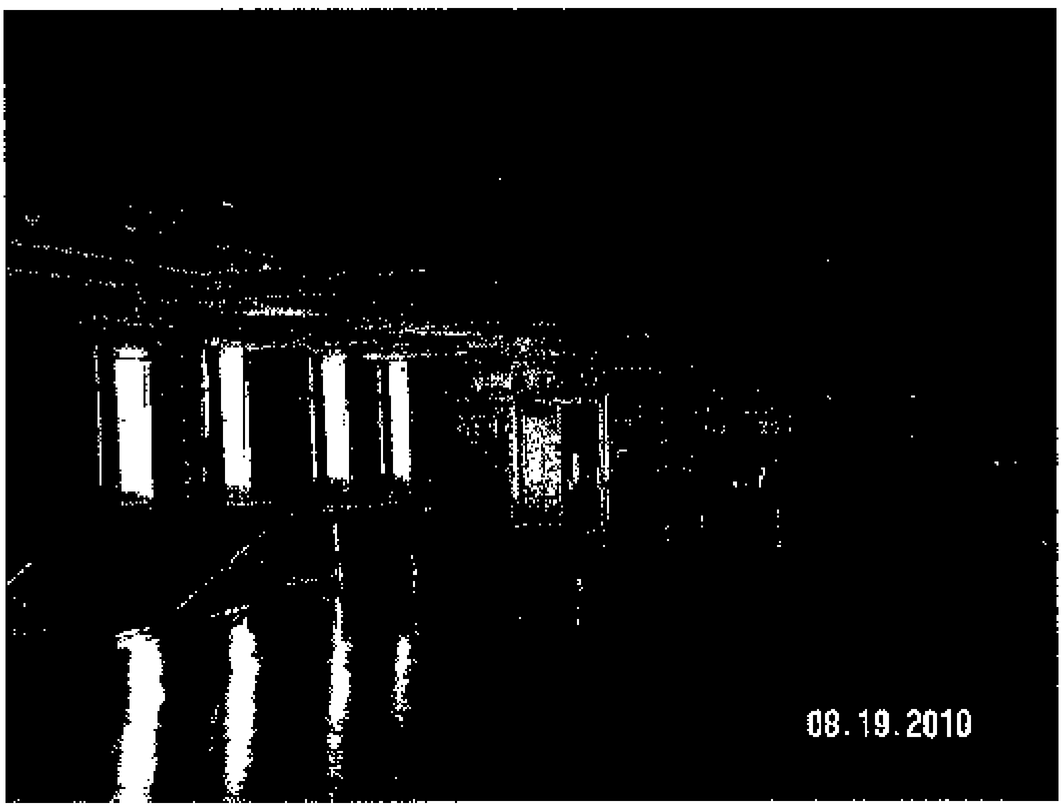


Photo 12: Drill Hall

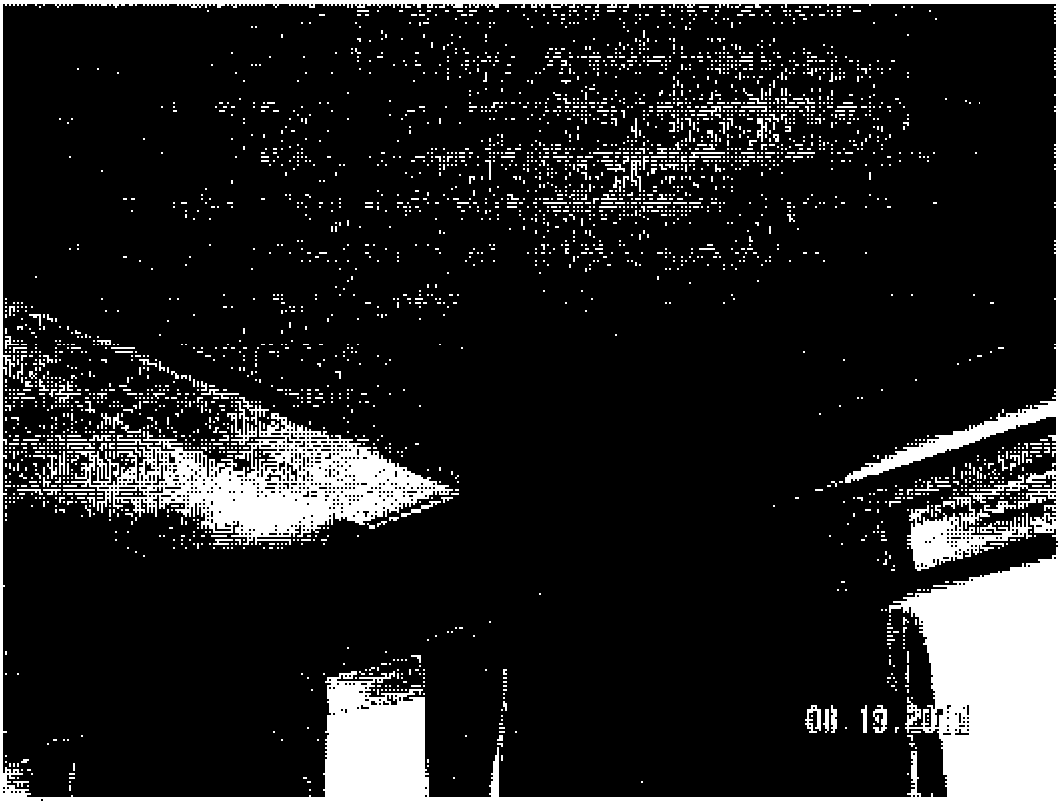


Photo 13: Drill Hall ceiling; chipping/peeling paint, water damage

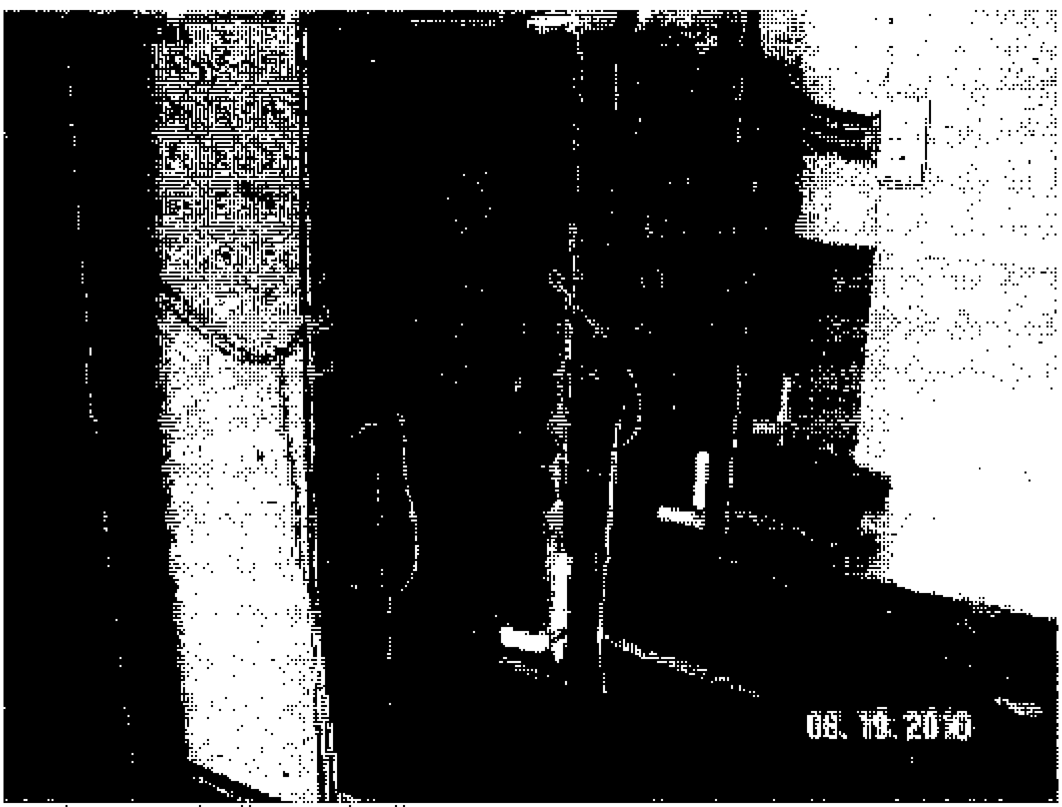


Photo 14: Air handling units (AHUs)

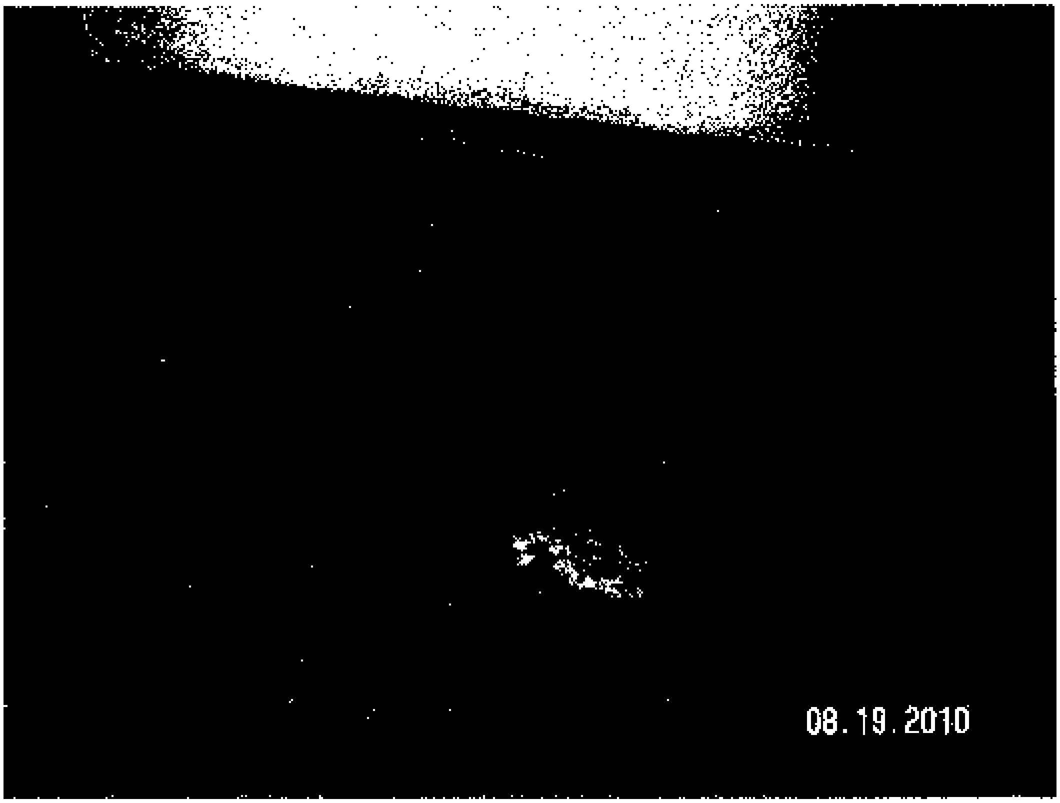


Photo 15: AHUs leaked; damaged and warped vinyl flooring tiles

Appendix C
Floor Plan

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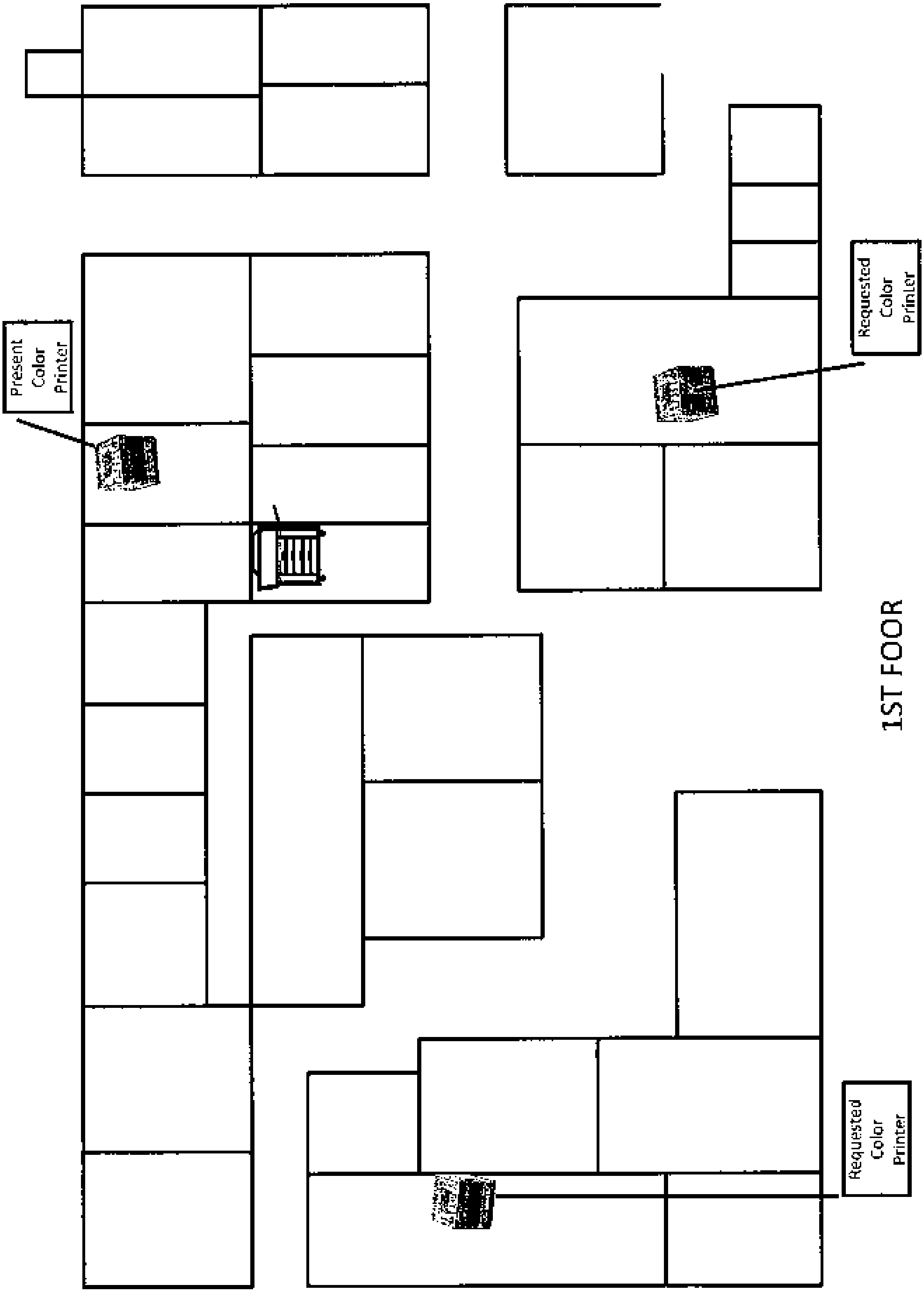
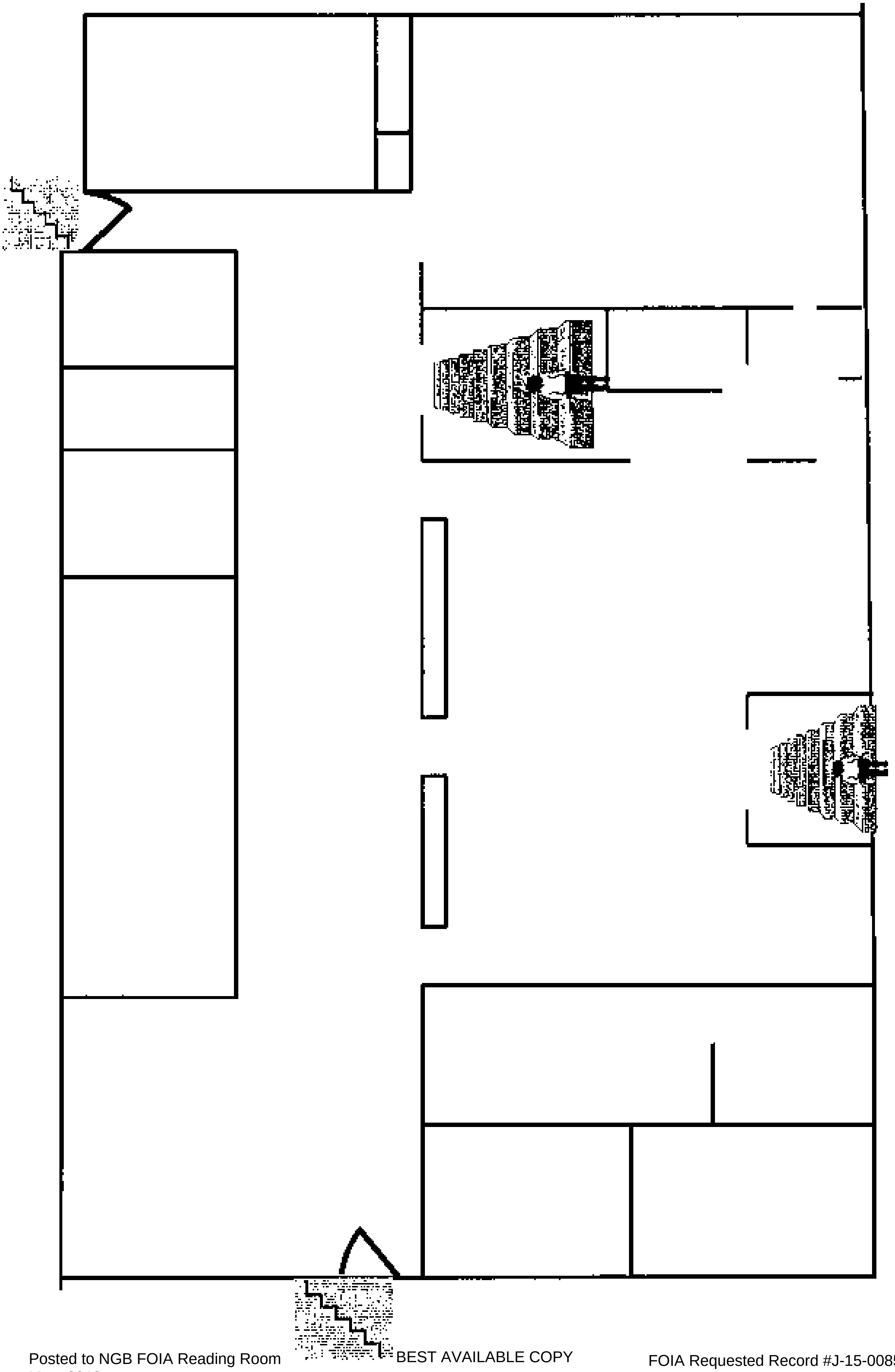

Present Color Printer
Requested Color Printer
1ST FOOR
Requested Color Printer



~~1ST FOOR~~
2nd Floor

BEST AVAILABLE COPY

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 (ACGIH) Threshold Limit Values and Biological Exposure Indices, 2010 Edition

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition

4. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007

5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

7. National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

8. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h)(3)]

9. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

10. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation

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COMPLIANCE MANAGEMENT INTERNATIONAL

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Industrial Hygiene Survey Report

National Guard Facility
Havre de Grace Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Havre de Grace Readiness Center** **301 Old Bay Lane** **Havre de Grace, MD 21078**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**May 29, 2013**
Report Date:	**June 24, 2013**

Non-Responsive
[redacted]

Manager, Industrial Hygiene Services

Table of Contents

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on May 29, 2013, at the Havre de Grace Readiness Center located at 301 Old Bay Lane, Havre de Grace, MD 21078. The survey was performed by Mr. [redacted].

1. Lead surface, bulk, and air samples were collected. Surface levels of lead exceeded 200 micrograms per square foot (ug/ft^2) in two locations. See Section 3.0 for detailed findings.

2. Lighting levels did not meet the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in three 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 two areas sampled.

   b. The relative humidity levels were above the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in all indoor 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 (CO_2) levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings.

   See Section 5.0 for detailed sampling results.

4. Water-stained ceiling tiles were observed in the facility. See Section 5.0 for detailed findings.

5. Isolated areas of suspected asbestos containing materials (ACM) were damaged. See Section 6.0 for detailed findings.

Section 2.0 Operation Description & Observations

The Havre de Grace Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, conference room and a converted firing range area (currently offices). There were approximately 16 full-time employees stationed at this facility at the time of this survey.

The building was reported to have been built in 1924 and was converted from a grandstand of a race track. It is a two-story structure with a basement. The exterior is constructed of wood and shingles. The interior walls are plaster, paneling, wood, and drywall in some of the offices. The floors are concrete, wood and floor tile.

The heating system consists of a gas-fired hot water generating unit. There is no central air conditioning. Some window air conditioners are present.

There is no child-care facility in the building.

It was reported that the basement area was infested with rats. The area has been treated. There is a residual on the floor. It was recommended that CMI not enter the area.

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 office space.

Peeling paint was observed on the exterior of the build. Both asbestos and suspect lead-based paint was observed along the exterior drip line of the building.

Housekeeping practices were adequate.

Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 micrometer (um) mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Bulk (%)	Surface ug/ft^2
1	Drill Hall	<6.4	*	*
2	Converted Range Hallway	<6.4	*	*
3	Drill Hall – Floor	*	*	<110
4	**Drill Hall – Top of Piano**	*****	*****	**470**
5	Drill Hall – Top of Fire Place Mantel	*	*	<110
6	**Dining Room – Top Radiator**	*****	*****	**350**
7	Dining Room – Top of Bar	*	*	<110
8	Wall Locker Storage Area – Top of Wall Locker	*	*	<110
9	Converted Firing Range Hallway – Floor	*	*	<110
10	Converted Firing Range Hallway – Ladder	*		<110
11	BN SGM Office – Top of TV	*	*	<110
12	GS Maintenance Office – Top of Book Shelf	*	*	<110
13	Motor Pool Office – Top of Table	*	*	<110
14	Main Office Area – Top of Desk	*	*	<110
15	Blank Wipe	*	*	<12 ug
16	Blank Air	<3 ug	*	*
17	Exterior Paint Chip Composite	*	0.23	*
-	**Criteria**	**50**	**0.5**	**200**

Table Notes:
1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2 =** micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Sources:
1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges
2. OSHA 29CFR1910.1025 Lead Standard

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The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 "Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on 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 exceeded the recommended guideline of 200 ug/ft^2 in the following locations:
  - Drill Hall – Top of Piano
  - Dining Room – Top of Radiator
- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m^3).
- One composite paint chip sample was collected from the exterior front screened in porch entrance and the painted exterior wood on the side of the building. The lab result from this sample was 0.23% Pb which is less than the regulatory limit of 0.5%. However, all areas of peeling paint should be repaired.

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Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98011EL). The light meter was last calibrated in November 2012. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Drill Hall	31.0	10	Yes
Dining Hall	27.7	10	Yes
Wall Locker Storage Area	22.1	10	Yes
Conference Room	49.7	30	Yes
BN XO Office	87.6	30-50	Yes
BN Sgt Maj Office	**26.4**	**30-50**	**No**
BN CO Office	**25.4**	**30-50**	**No**
GS Admin Office	**25.6**	**30-50**	**No**
GS Maintenance Office	54.3	30-50	Yes
Copy Room	77.1	10	Yes
Main Office Area	30.1	30-50	Yes
Motor Pool Office	52.1	30-50	Yes
Recruiting Lobby	32.8	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 level did not meet the minimum recommended guideline in the BN Sgt Major Office, BN CO Office and the GS Admin Office. Lighting should be improved in these areas.

Section 5.0 Indoor Air Quality

Survey measurements were made for comfort parameters and ventilation (temperature, relative humidity, carbon dioxide, and carbon monoxide). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7575-X (Serial #1228008). The IAQ Meter was last calibrated in July 2012.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2010). ASHRAE specifies temperature ranges for human comfort (ASHRAE 55-2010). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60%.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Drill Hall	73.1	**69.7**	667	0.0
Dining Hall	73.5	**67.4**	690	0.0
Conference Room	74.8	**65.8**	672	0.0
BN XO Office	73.8	**65.8**	762	0.0
Main Office Area	74.2	**67.8**	622	0.0
Motor Pool Office	75.0	**65.1**	813	0.0
Outdoors	89.1	44.6	320	0.0
Criteria	**68-79**	**30-60**	**<1,020**	**<9**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **°F =** degrees Fahrenheit

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements were within the recommended guideline of 68-79°F in all sampled areas.

- Relative humidity levels were above the recommended guideline of 30-60% in all sampled areas. High relative humidity can provide an environment suitable for microbial growth and proliferation.

- 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 1,020 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:

  - Water-stained ceiling tiles were observed in the facility.
  - Window air conditioning units running and doors to the exterior left open.

Section 6.0 Suspect Asbestos Containing Building Materials

The following suspect ACM was noted at the time of this survey:

1. The facility has 12”X12” floor tiles and black mastic in most rooms. In the kitchen and dining areas some sections of flooring were loose, damaged and in poor condition. < 10% of the total floor tile was damaged. Samples of these materials were collected and analyzed for asbestos content. Both the floor tile and floor tile mastic contained asbestos. The floor tile was 4% Chrysotile asbestos and the black floor tile mastic was 5% Chrysotile asbestos.

2. The exterior of the building is covered with asbestos containing shingles. Some isolated area of damage was observed. Less than 10% of the total shingles were damaged. A sample of the shingles was analyzed and found to contain 5% Chrysotile asbestos.

Damaged ACM should be properly repaired or abated.

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

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Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98011EL	11/2012	NA
SKC Air Sampling Pump	647598	5/29/13	2.5 LPM
SKC Air Sampling Pump	648349	5/29/13	2.5 LPM

Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

Appendix A. Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #100470

Client:	National Guard Bureau	**Job Name:**	Havre de Grace RC	**Chain Of Custody:**	516026
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Havre de Grace, MD	**Date Submitted:**	6/4/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	Non-Responsive [redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	6/11/2013
				Report Date:	6/11/2013

Attention: Non-Responsive [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
13067164	1	Flame	Air	468	N/A	6.4	ug/m³	<3	<6.4	ug/m³	
13067165	2	Flame	Air	468	N/A	6.4	ug/m³	<3	<6.4	ug/m³	
13067166	3	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067167	4	Flame	Wipe	****	0.108	110	ug/ft²	51	470	ug/ft²	
13067168	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067169	6	Flame	Wipe	****	0.108	110	ug/ft²	38	350	ug/ft²	
13067170	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067171	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067172	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067173	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067174	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067175	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067176	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067177	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067178	15	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13067179	16	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13067180	17	Flame	Paint Chip	****	N/A	0.011	%Pb		0.23	%Pb	

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AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Client: National Guard Bureau
Address: 301-JH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation
Havre de Grace, Maryland 21078

Job Name: Havre de Grace RC
Job Location: Havre de Grace, MD
Job Number: Not Provided
P.O. Number: W912K6-09-A-0003

Chain Of Custody: 516026
Date Submitted: 6/4/2013
Person Submitting: [redacted]
Date Analyzed: 6/11/2013 **Report Date:** 6/11/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)
%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results
Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: N. McGarvey / S. Chinnapad

Technical Manager: G Edward Carney

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OWI (410) 247-2024 159202 210 REV. 6.08

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Focused on Results www.amalab.com
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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **516026**

page 1 of 2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Havre de Grace RC
2. Job Location: Havre de Grace MD
3. Job #: [redacted] P.O. #: W912K6-09-A-0003
4. Contact Person: [redacted] @ phone #: (410) 942-0273
5. Submitted By: [redacted] Signature: [redacted]

Reporting Information (Results will be provided [redacted]).

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due: ______
☐ 24 Hours Time Due: ______
Comments: ______

NORMAL BUSINESS HOURS
~~Immediate~~ ☐ 3 Day
☐ Next Day ☒ 5 Day + Date Due: 6/11/13
☐ 2 Day
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Incl[redacted] with Report
☒ Em[redacted] @compliancesphere.com
☐ Fax [redacted] @us.army.mil
☐ Ver[redacted] @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ______(QTY)
☐ Fiberglass ______(QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ______(QTY)
☐ NIOSH 7402 ______(QTY)
☐ Other (specify ______) ______(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ______(QTY)
☐ EPA Point Count ______(QTY)
☐ NY State Friable 198.1 ______(QTY)
☐ Grav. Reduction ELAP 198.6 ______(QTY)
☐ Other (specify ______) ______(QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ______(QTY)
☐ NY State PLM/TEM ______(QTY)
☐ Residual Ash ______(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ______(QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______(QTY)
☐ Quan. (s/area)Dust D6480-99 ______(QTY)
TEM Water
☐ Qual. (pres/abs) ______(QTY)
☐ ELAP 198.2/EPA 100.2 ______(QTY)
☐ EPA 100.1 ______(QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples ______°C)

Metals Analysis
☐ Pb Paint Chip ______(QTY)
☐ Pb Dust Wipe (wipe type ______) ______(QTY)
☐ Pb Air ______(QTY)
☐ Pb Soil/Solid ______(QTY)
☐ Pb TCLP ______(QTY)
☐ Drinking Water ☐ Pb ___(QTY) ☐ Cu ___(QTY) ☐ As ___(QTY)
☐ Waste Water ☐ Pb ___(QTY) ☐ Cu ___(QTY) ☐ As ___(QTY)
☐ Pb Furnace (Media ______) ______(QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
☐ Spore-Trap ______(QTY) ☐ Surface Vacuum Dust ______(QTY)
☐ Surface Swab ______(QTY) ☐ Culturable ID Genus (Media ______) ______(QTY)
☐ Surface Tape ______(QTY) ☐ Culturable ID Species (Media ______) ______(QTY)
☐ Other (Specify ______) ______(QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1	Drill Hall	5-29	468					X		X						
2	Converted Range		468					X		X						
3	Drill Hall - Floor			100 cm²				X				X				
4	Drill Hall - Top of Range							X				X				
5	Drill Hall - Fire place							X				X				
6	Dining Room - Heater Grill							X				X				
7	Dining Room Bar							X				X				
8	Wall locker storage - Wall							X				X				
9	Converted Range Hall floor							X				X				
10	Converted Range - Ladder							X				X				
11	Bn. SGM. TV.							X				X				
12	GS Maint. office Book shelf							X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY (CUSTODY)
1. Date/Time RCVD: 6/4/13 @1000 Via: FedEx By (Print): [signature] Sign: [signature]
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ___/___/___ Time: ______ Initials: ______
4. Comments: 1945 0158 6076

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516026
page 2 of

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Havre de Grace - RC
2. Job Location: Havre de Grace - MD
3. Job #: ______ P.O. #: W912K6-09-A-0003
4. Contact Person: Non-Responsive @ ph Non-Responsive 942-0273
5. Submitted By: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS			REPORT TO:
☐ Immediate Date Due:	☒ Immediate	☐ 3 Day	☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ Incl Non-Responsive ith Report
☐ 24 Hours Time Due:	☐ Next Day	☐ 5 Day +		☒ Ema [redacted] @amalabmpls.com
Comments:	☐ 2 Day	Date Due:		☐ Fax: [redacted] us.army.mil
				☐ Verb [redacted] us.army.mil

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
- ☐ NIOSH 7400 ______ (QTY)
- ☐ Fiberglass ______ (QTY)

TEM Air -- Please Indicate Filter Type:
- ☐ AHERA ______ (QTY)
- ☐ NIOSH 7402 ______ (QTY)
- ☐ Other (specify ______) ______ (QTY)

PLM Bulk
- ☒ EPA 600 – Visual Estimate 2 (QTY)
- ☐ EPA Point Count ______ (QTY)
- ☐ NY State Friable 198.1 ______ (QTY)
- ☐ Grav. Reduction ELAP 198.6 ______ (QTY)
- ☐ Other (specify ______) ______ (QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM __ (Qual) PLM __ (Quan) PLM/TEM __ (Qual) PLM/TEM __ (Quan)

TEM Bulk
- ☐ ELAP 198.4/Chatfield ______ (QTY)
- ☐ NY State PLM/TEM ______ (QTY)
- ☐ Residual Ash ______ (QTY)

TEM Dust
- ☐ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
- ☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
- ☐ Quan. (s/area)Dust D6480-99 ______ (QTY)

TEM Water
- ☐ Qual. (pres/abs) ______ (QTY)
- ☐ ELAP 198.2/EPA 100.2 ______ (QTY)
- ☐ EPA 100.1 ______ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ______ °C)

Metals Analysis
- ☒ Pb Paint Chip 1 (QTY)
- ☐ Pb Dust Wipe (wipe type Ghost) 13 (QTY)
- ☒ Pb Air 3 (QTY)
- ☐ Pb Soil/Solid ______ (QTY)
- ☐ Pb TCLP ______ (QTY)
- ☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Pb Furnace (Media ______) ______ (QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
- ☐ Spore-Trap ______ (QTY) ☐ Surface Vacuum Dust ______ (QTY)
- ☐ Surface Swab ______ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
- ☐ Surface Tape ______ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
- ☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13 Motor Pool office	Table	5-29		100 in²				X				X				
14 Main office	Area Desk			↓				X				X				
15 Blank - wipe				0				X								
16 Blank - Air		0						X		X						
17 Bulk Ext	- composite							X			X					
18 Ext. Siding							X				X					
19 Bravery Hall	12x12 tile mastic						X				X					

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY (CUSTODY)
1. Date/Time RCVD: ____ / ____ / ____ @ ____ Via: ______ By (Print): ______ Sign: ______
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ____ / ____ / ____ Time: ____ Initials: ____
4. Comments: ______

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP® 101143-0

Client:	National Guard Bureau	**Job Name:**	Havre de Grace RC	**Chain Of Custody:**	516026
Address:	301-1H Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Havre de Grace, MD	**Date Analyzed:**	6/11/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003		

Attention: [redacted]

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments
13067181	18	5	5	--	--	--	--	--	--	--	--	95	SD	White	Homogeneous	LBP	
13067182	19 FT	4	4	--	--	--	--	--	--	--	--	96	FT	Beige	Homogeneous	LBP	
13067183	19 M	5	5	--	--	--	--	--	3	--	--	92	MS	Black	Homogeneous	LBP	

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

NAD = "No Asbestos Detected" TR = "Trace equals less than 1% of this component"

Uncertainty: For samples containing asbestos in range of 1-10% the CV is 0.43, 11-35% CV=0.55, >35 CV=0.23

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Technical Director Peerawut Chaikeenee **Analyst(s)** Lom Butruk

Lom Butruk

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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) **516026**

Mailing/Billing Information:

1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:

1. Job Name: Havre de Grace RC
2. Job Location: Havre de Grace - MD
3. Job #: [redacted] Non-Responsive PO #: W912K6-09-A-0003
4. Contact Pers[redacted] @ ph[redacted] Non-Responsive (410) 942-0273
5. Submitted [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be prescheduled)	NORMAL BUSINESS HOURS			REPORT TO:
☐ Immediate Date Due: ____	☒ Immediate	☐ 3 Day	☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ In[redacted] Non-Responsive [redacted]ith Report
☐ 24 Hours Time Due: ____	☐ Next Day	☒ 5 Day +		☒ [redacted] Compliancesplace.com
Comments: ____	☐ 2 Day	Date Due: 6/11/13		☐ Fa[redacted]us.army.mil
				☐ Ve[redacted]us.army.mil

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
- ☐ NIOSH 7400 ____ (QTY)
- ☐ Fiberglass ____ (QTY)

TEM Air – Please Indicate Filter Type:
- ☐ AHERA ____ (QTY)
- ☐ NIOSH 7402 ____ (QTY)
- ☐ Other (specify ____) ____ (QTY)

PLM Bulk
- ☐ EPA 600 – Visual Estimate ____ (QTY)
- ☐ EPA Point Count ____ (QTY)
- ☐ NY State Friable 198.1 ____ (QTY)
- ☐ Grav. Reduction ELAP 198.6 ____ (QTY)
- ☐ Other (specify ____) ____ (QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM __ (Qual) PLM __ (Quan) PLM/TEM __ (Qual) PLM/TEM __ (Quan)

TEM Bulk
- ☐ ELAP 198.4/Chatfield ____ (QTY)
- ☐ NY State PLM/TEM ____ (QTY)
- ☐ Residual Ash ____ (QTY)

TEM Dust
- ☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
- ☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
- ☐ Quan. (s/area) Dust D6480-99 ____ (QTY)

TEM Water
- ☐ Qual. (pres/abs) ____ (QTY)
- ☐ ELAP 198.2/EPA 100.2 ____ (QTY)
- ☐ EPA 100.1 ____ (QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
- ☐ Pb Paint Chip ____ (QTY)
- ☐ Pb Dust Wipe (wipe type ____) ____ (QTY)
- ☐ Pb Air ____ (QTY)
- ☐ Pb Soil/Solid ____ (QTY)
- ☐ Pb TCLP ____ (QTY)
- ☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
- ☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
- ☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
- ☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
- ☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1 Drill Hall		5-29	468					X		X						
2 Converted	Range	↓	465					X		X						
3 Drill Hall -	floor	↓		100 cm²				X				X				
4 Drill Hall -	Top of Rack	↓		↓				X				X				
5 Drill Hall -	Fire place	↓		↓				X				X				
6 Dining Room -	Heater Grill	↓		↓				X				X				
7 Dining Room	Bar	↓		↓				X				X				
8 Wall locker	Storage - wall lip	↓		↓				X				X				
9 Converted Range	Hall - floor	↓		↓				X				X				
10 Converted Range -	Ladder	↓		↓				X				X				
11 BLD. STGM.	TV.	↓		↓				X				X				
12 GS Maint. Office.	Book shelf	↓		↓				X								

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY: (CUSTODY)

1. Date/Time RCVD: 6 / 4 / 13 @ 1000 Via: FedEx By (Print): [signature] Sign: [signature]
2. Date/Time Analyzed: 6 / 11 / 13 @ 15:35 By (Print): Lon Butrus Sign: Lon Butrus
3. Results Reported To: Shirley Chapman Via: Email Date: 6 / 11 / 13 Time: 0830 Initials: ____
4. Comments: 19450158 Coll/lab

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AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

Mailing/Billing Information:

1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:

1. Job Name: Havre de Grace - RC
2. Job Location: Havre de Grace - MD
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person: Non-Responsive [redacted] @ phone: Non-Responsive [redacted] 0273
5. Submitted by: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS			REPORT TO:
☐ Immediate Date Due:	☑ Immediate	☐ 3 Day	☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ Incl Non-Responsive [redacted] with Report
☐ 24 Hours Time Due:	☐ Next Day	☐ 5 Day +		☒ Email [redacted] ...us.army.mil
Comments:	☐ 2 Day	Date Due:		☐ Fax: [redacted] ...us.army.mil
				☐ Verbal [redacted]

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
- ☐ NIOSH 7400 ____(QTY)
- ☐ Fiberglass ____(QTY)

TEM Air – Please Indicate Filter Type:
- ☐ AHERA ____(QTY)
- ☐ NIOSH 7402 ____(QTY)
- ☐ Other (specify____) ____(QTY)

PLM Bulk
- ☒ EPA 600 – Visual Estimate 2 (QTY)
- ☐ EPA Point Count ____(QTY)
- ☐ NY State Friable 198.1 ____(QTY)
- ☐ Grav. Reduction ELAP 198.6 ____(QTY)
- ☐ Other (specify____) ____(QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
- ☐ ELAP 198.4/Chatfield ____(QTY)
- ☐ NY State PLM/TEM ____(QTY)
- ☐ Residual Ash ____(QTY)

TEM Dust
- ☐ Qual. (pres/abs) Vacuum/Dust ____(QTY)
- ☐ Quan. (s/area) Vacuum D5755-95 ____(QTY)
- ☐ Quan. (s/area)Dust D6480-99 ____(QTY)

TEM Water
- ☐ Qual. (pres/abs) ____(QTY)
- ☐ ELAP 198.2/EPA 100.2 ____(QTY)
- ☐ EPA 100.1 ____(QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____°C)

Metals Analysis
- ☒ Pb Paint Chip 1 (QTY)
- ☐ Pb Dust Wipe (wipe type Ghost) 13 (QTY)
- ☒ Pb Air 3 (QTY)
- ☐ Pb Soil/Solid ____(QTY)
- ☐ Pb TCLP ____(QTY)
- ☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Pb Furnace (Media ____) ____(QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
- ☐ Spore-Trap ____(QTY) ☐ Surface Vacuum Dust ____(QTY)
- ☐ Surface Swab ____(QTY) ☐ Culturable ID Genus (Media____) ____(QTY)
- ☐ Surface Tape ____(QTY) ☐ Culturable ID Species (Media____) ____(QTY)
- ☐ Other (Specify____) ____(QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
13	Motor Pool office Table	5-29		100 in²				X				X					Date/Time: Contact: By:
14	Main office Area Desk			↓				X				X					
15	Blank – wipe			0				X				X					
16	Blank Air	0						X		X							
17	Quills Rd – composite							X			X						Date/Time: Contact: By:
18	Ext Siding						X				X						
19	Drying Hall [illegible]						X				X						
																	Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)

1. Date/Time RCVD: ___/___/___ @____ Via:____ By (Print): ____ Sign: ____
2. Date/Time Analyzed: ___/___/___ @____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ___/___/___ Time: ____ Initials: ____
4. Comments:

Appendix B. Photographs

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Exterior

Exterior damaged suspect asbestos shingles

Exterior front peeling paint

Exterior side of facility peeling paint

Exterior of facility suspect asbestos shingles and suspect lead-based paint on ground at drip line around the facility

Kitchen and dining area damaged 12"X12" suspect asbestos floor tile and mastic

Drill Hall

Water stained ceiling tiles throughout the facility

Effloresce on exterior wall in commo room

Converted firing range/office space hallway

Appendix C. Floor Plan

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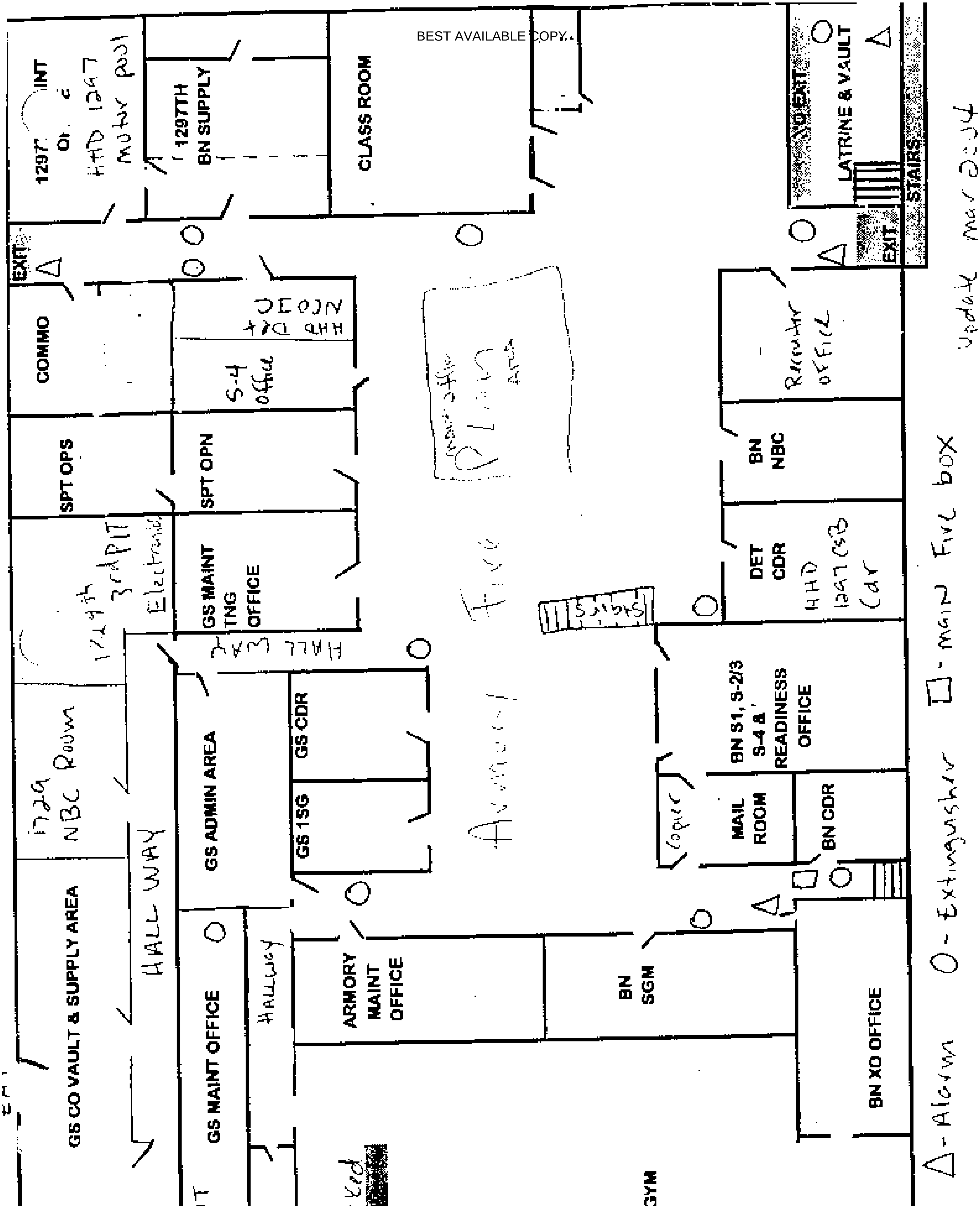

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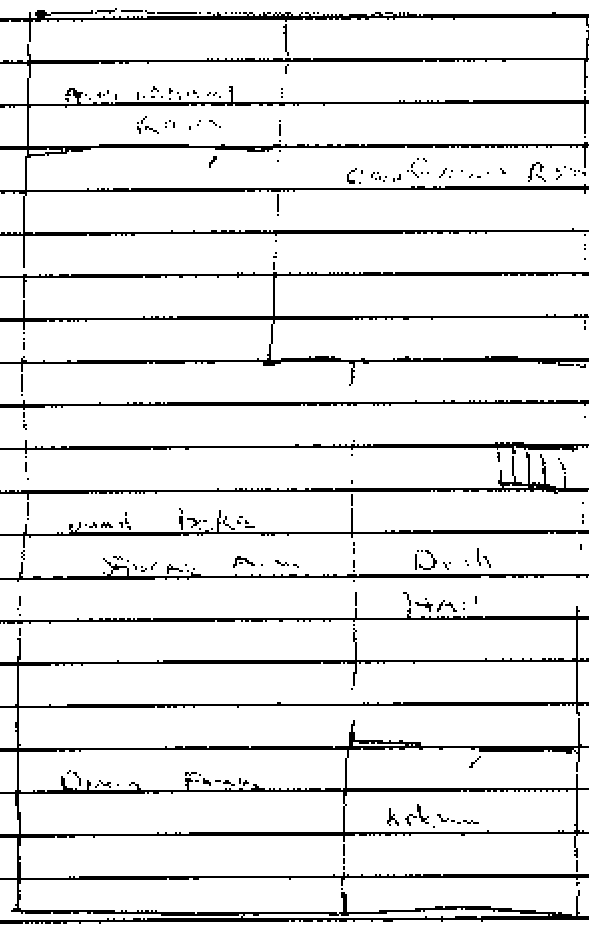
COMPLIANCE MANAGEMENT INTERNATIONAL

1215 Manor Drive, Suite 205
Mechanicsburg, PA 17055
Phone: 215.699.4800
Fax: 215.699.8315

Daily Notes

Date: [illegible] 2nd fl

Project Name: [illegible]



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

REPLY TO
ATTENTION OF

MCHB-TS-OFS May 2004

MEMORANDUM FOR Army National Guard Bureau (NGB) Region North Industrial Hygiene NGB-AVS-SI-[redacted], 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03 BG William Smallwood Armory, La Plata, MD

1. Enclosed is a copy of subject report and one CD-ROM.

2. Please direct any additional comments or concerns to Ms. [redacted], at DSN 584-5475/3118, commercial (410) 436-5475/3118 or e-mail address at [redacted]@apg.amedd.army.mil.

ENCL

[redacted]
Industrial Hygienist
Industrial Hygiene Field Services Program

Readiness thru Health
Printed on Recycled Paper

U.S. Army Center for Health Promotion and Preventive Medicine

USACHPPM

CONSERVARE SALUTEM

MDARNG FACILITIES IH BASELINE SURVEY
BG WILLIAM SMALLWOOD ARMORY
LA PLATA, MD
55-ML-01ED-03

Approved for public release; distribution unlimited.

CHPPM FORM 432-E (MCHB-CS-IPD), OCT 03

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U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed $3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- ♦ *Integrity is the foundation*
- ♦ *Excellence is the standard*
- ♦ *Customer satisfaction is the focus*
- ♦ *Its people are the most valued resource*
- ♦ *Continuous quality improvement is its pathway*

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

CHPPM FORM 433-E (MCHB-CS-IPD), OCT 03 *(reverse)*

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS, BG WILLIAM SMALLWOOD ARMORY
LA PLATA, 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 carbon dioxide levels. The indoor carbon dioxide levels ranged from 399 to 671 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. The indoor temperature of 80.8 degrees Fahrenheit exceeds the recommended ASHRAE guidelines for an acceptable thermal environment. ASHRAE guidelines are between 73 and 79 degrees Fahrenheit in the summer and between 68 and 74.5 degrees Fahrenheit in the winter. The armory relative humidity of 72.7 % exceeded the recommended ASHRAE guidelines for air quality of 30 to 60 %.

b. 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 motor maintenance bay table top by the outside door, exceeded the USACHPPM recommended decontamination level of 200$\mu g/ft^2$ for dust-lead on frequently contacted surfaces. Two additional surface dust-lead wipe sample results exceeded the EPA lead exposure levels of 40$\mu g/ft^2$ for children for dust-lead on floors. The first sample result was from the motor maintenance bay floor center by the office door, and the second from the former range lobby floor behind the door to the lobby.

c. Asbestos Floor Tiles. The presumed asbestos floor tiles in the armory are intact. If they become damaged in the future the asbestos tiles may become friable and asbestos fibers may be released.

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d. 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.

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. Lead RACs and Recommendations. The RAC for this armory for Lead Exposure is classified as 5. Clean all areas in and adjacent to the motor maintenance bay office and the former indoor firing range 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. The converted IFR should be sampled. Recleaning and sealing the IFR may further prevent lead from being 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 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.

b. The RAC for Indoor Air Quality is classified as 5. Install more air conditioning units or fans to cool the armory to between 73 and 79 degrees Fahrenheit in the summer. Maintain the temperature in the winter between 68 and 74.5 degrees Fahrenheit. To maintain the relative humidity between 30 and 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. 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.

d. Industrial Hygiene and Safety Programs Recommendations. Provide a HAZCOM and Respiratory Protection Program for the full time state workers who oversee the armory. Provide a HAZCOM and Respiratory Protection Program for the full time state workers who oversee the armory.

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MDARNG Facilities IH Baseline Surveys Brig GEN William Smallwood Armory,
La Plata, MD Project No. 55-ML-01ED-03

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

REPLY TO
ATTENTION OF

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03

LOCATION: BG William Smallwood Armory, La Plata, 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 121st Engineering Battalion, Company A.

a. Date of Construction. 1954.

c. Survey date. September 3, 2003.

d. POC. SGM Non-Responsive (410) 974-7400 Cell (443) 277-4923.

e. USACHPPM did not evaluate any of the offices or converted IFR, except for the vehicle maintenance shop office, because the POC did not have access to any of the keys for the locked doors. The two state employees who had oversight of this facility recently left government service; the POC for this survey was the manager of the Prince Frederick Armory. The former IFR has been converted into a storage area for the Maryland Defense Office.

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 (CO2), temperature and humidity measurements were collected to determine indoor air quality. Lighting conditions were measured. Sample locations are listed in Appendix D.

b. Physical Condition of Facilities.

(1) Paint. The paint condition is intact. Sergeant [redacted], Environmental Compliance Assessment Coordinator for the MD NGB, stated that there are no records of lead-based paint abatement.

(2) Asbestos. Staff Sergeant [redacted] 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.

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.

h. Converted indoor firing range (IFR). Staff Sergeant [redacted], Environmental Compliance Assessment Coordinator for the MD NGB, stated that all lead was abated from the indoor firing range during its conversion.

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.

5. ASSESSMENT CRITERIA FOR LEAD. (Appendix A).

6. SAMPLING RESULTS. The armory relative humidity of 72.7 % exceeded the recommended ASHRAE guidelines for air quality of 30% to 60 %. 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.

a. Indoor Air Quality: The indoor carbon dioxide levels met the ASHRAE recommended guidelines. The indoor carbon dioxide levels ranged from 399-671 parts per million (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 concentration range should be between 350 and 1050 ppm.

Table 1: Q-Trak Measurements for Indoor Air Quality

	Floor	Indoor Measurements	Outdoor Measurements
Lobby	First	530 parts per million (ppm) CO_2	350 ppm CO_2
Lounge/Training Room	First	660 ppm CO_2	350 ppm CO_2
Drill Floor (room)	First	438 ppm CO_2	350 ppm CO_2
Motor Maintenance Area	First	444 ppm CO_2	350 ppm CO_2
Motor Maintenance Office	First	623 ppm CO_2	350 ppm CO_2
Former Firing Range Area lobby	First	414 ppm CO_2	350 ppm CO_2
Office Area Corridor	First	399 ppm CO_2	350 ppm CO_2
Locker room	Second	671 ppm CO_2	350 ppm CO_2

b. Illumination. All areas of the armory are adequately lit and occupants reported no areas of deficient lighting. The lighting met the Illumination Engineering Society of North America Guidelines. (See Table 2).

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Table 2: Lighting Measurements

Location	Floor	Measurement	Guidelines
Locker Room	Second	8.41 Foot Candles (FC)	10 FC
Office Area Corridor	Second	5.50 FC	5 FC
Former Firing Range Area lobby	First	75.0 FC	20 FC
Drill Floor	First	4.1 FC (no lights on)	10 FC
Motor Maintenance Office	First	42.5 FC	20-50 FC
Lounge/Training Room	First	7.6 FC	10-20 FC
Lobby	First	14.5 FC	10 FC
Office Area Corridor	First	7.5 FC	5 FC

c. Lead. All air samples are below the laboratory analytical detection limit for lead in air of 3.0 to 15.0µg/m³. This is also below the Occupational Health and Safety Administration (OSHA) standard of 50µg/m³ for lead in air. One dust-lead wipe sample result, located on the motor maintenance bay table top by the outside door, exceeded the USACHPPM recommended decontamination level of 200µg/ft² for dust-lead on frequently contacted surfaces. (photo # 0943). Two additional surface dust-lead wipe sample results exceeded the EPA lead exposure levels of 40µg/ft² for children for dust-lead on floors. The first sample result was from the motor maintenance bay floor center by the office door (photo # 0944), and the second from the former range lobby floor behind the door to the lobby (photo # 0950). (See Table 3).

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MDARNG Facilities IH Baseline Surveys, BG William Smallwood Armory, La Plata, MD
Project No. 55-ML-01ED-03

TABLE 3: Lead Air and Dust Wipe Results

Lead Sample Numbers	Type of Sample	Location	Floor	Photo Numbers	Results
LP W01	Wipe	Lounge/Training Room table wall next to door to drill room	First	0940	11 µg/ft²
LP W02	Wipe	Lounge/Training Room floor by door to lobby	First	0941	<2.8 µg/ft²
LP W03	Wipe	Lounge/Training Room chair by window	First	0942	7 µg/ft²
LP W04	Wipe	Motor Maintenance Bay table top by outside door	First	0943	1400 µg/ft²
LP W05	Wipe	Motor Maintenance Bay floor center by office door	First	0945	88 µg/ft²
LP W06	Wipe	Motor Maintenance Bay floor by press	First	0946	18 µg/ft²
LP W07	Wipe	Motor Maintenance Office desk top	First	0946	5.5 µg/ft²
LP W08	Wipe	Motor Maintenance Office floor center far wall	First	0947	<2.8 µg/ft²
LP W09	Wipe	Kitchen table top	First	0948	3.4 µg/ft²
LP W10	Wipe	Former Range Lobby floor in front of cage door	First	0949	38 µg/ft²
LP W11	Wipe	Former Range Lobby floor behind door to lobby	First	0950	81 µg/ft²
LP W12	Wipe	Drill Room starter table top	First	0951	4 µg/ft²
LP W13	Wipe	Drill Room floor center court	First	0952	4 µg/ft²
LP W14	Wipe	Drill Room floor by door to former range lobby door	First	0953	9.9 µg/ft²
LP W15	Wipe	Locker Room table top near front of building	Second	0954	5.7 µg/ft²
LP W16	Wipe	Locker Room floor center of room	Second	0955	<2.8 µg/ft²
30903RR01	Air	Lounge/Training Room bar	First	0938	<14 mg/m³
30903RR02	Air	Former Range Lobby cage door	First	0939	<15 mg/m³

7. DISCUSSION AND CONCLUSIONS.

a. The armory relative humidity of 72.7 % exceeded the recommended ASHRAE guidelines for air quality of 30-60 %. 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- 671 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 concentration range level should be between 350 and 1050 ppm in this armory.

b. All air samples are below the laboratory analytical detection limit for lead in air of 3.0 to 15.0µg/m^3. This is also below the Occupational Health and Safety Administration (OSHA) standard of 50µg/m^3 for lead in air. One dust-lead wipe sample result, located on the motor maintenance bay table top by the outside door, exceeded the USACHPPM recommended decontamination level of 200µg/ft^2 for dust-lead on frequently contacted surfaces. (photo # 0943). Two additional surface dust-lead wipe sample results exceeded the EPA lead exposure levels of 40µg/ft^2 for children for dust-lead on floors. The first sample result was from the motor maintenance bay floor center by the office door (0944), and the second from the former range lobby floor behind the door to the lobby (0950). 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 former firing range area may further prevent exposures for children under six and for the general workforce.

c. 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.

d. 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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8. RECOMMENDATIONS. Enclosure.

9. ADDITIONAL ASSISTANCE. For additional assistance, or questions concerning this report, please contact the undersigned at DSN 584-3118, commercial 410-436-3118, or by e-mail [redacted]@apg.amedd.army.mil.

[redacted]

INDUSTRIAL HYGIENIST
USACHPPM LEAD AND ASBESTOS TEAM LEADER
Industrial Hygiene Field Services Program
EPA AHERA Asbestos Inspector and Management Planner/
Certification Number MD-070340
EPA Lead Inspector and Lead Risk Assessor/
Certification Number 04-7913

ENCLOSURE

LA PLATA 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. The RAC for Asbestos Exposure is classified as 5.

1. Indoor Air Quality. RAC 5.

a. Install more air conditioning units or fans to cool the armory to between 73 and 79 degrees Fahrenheit in the summer. Maintain the temperature in the winter between 68 and 74.5 degrees Fahrenheit.

b. To maintain the relative humidity between 30 and 60 %, USACHPPM recommends either closing the windows and turning on the window air conditioning units or using a portable dehumidifier in the summer months.

2. Lead Exposure. RAC 5.

a. Clean all areas in and adjacent to the motor maintenance bay office and the former indoor firing range 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. The converted IFR should be sampled. 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.

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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 40µg/ft² on floors and 250µg/ft² for dust-lead on window sills.

3. Asbestos Exposure. RAC 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.

4. Other Recommendations. Provide a HAZCOM and Respiratory Protection Program for the full time state workers who oversee the armory.

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MDARNG Facilities IH Baseline Surveys Brig GEN William Smallwood Armory, La Plata, MD Project No. 55-ML-01ED-03

APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

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Subject: Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 $\mu g/ft^2$. This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. EPA standards (40 CFR 745.227(e)(8)(viii))are not directly applicable because they are developed for floors (40 $\mu g/ft^2$), windowsills (250 $\mu g/ft^2$) and window troughs (400 $\mu g/ft^2$) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. OSHA has no specific requirement for work area surfaces. The lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. OSHA used to cite a level of 200 $\mu g/ft^2$ in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 $\mu g/ft^2$ is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels above these recommendations do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All states will receive this guidance when it is completed.

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m^3 averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

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MDARNG Facilities IH Baseline Surveys Brig GEN William Smallwood Armory, La Plata, MD Project No. 55-ML-01ED-03

APPENDIX B

SITE MAPS

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MDARNG Facilities IH Baseline Surveys Brig GEN William Smallwood Armory, La Plata, MD Project No. 55-ML-01ED-03

APPENDIX C

PHOTOGRAPHS

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Photo Location	Floor	Photo Numbers
Lounge/Training Room table wall next to door to drill room	First	0940
Lounge/Training Room floor by door to lobby	First	0941
Lounge/Training Room chair by window	First	0942
Motor Maintenance Bay table top by outside door	First	0943
Motor Maintenance Bay floor center by office door	First	0945
Motor Maintenance Bay floor by press	First	0946
Motor Maintenance Office desk top	First	0946
Motor Maintenance Office floor center far wall	First	0947
Kitchen table top	First	0948
Former Range Lobby floor in front of cage door	First	0949
Former Range Lobby floor behind door to lobby	First	0950
Drill Room starter table top	First	0951
Drill Room floor center court	First	0952
Drill Room floor by door to former range lobby door	First	0953
Locker Room table top near front of building	Second	0954
Locker Room floor center of room	Second	0955
Lounge/Training Room bar	First	0938
Former Range Lobby cage door	First	0939

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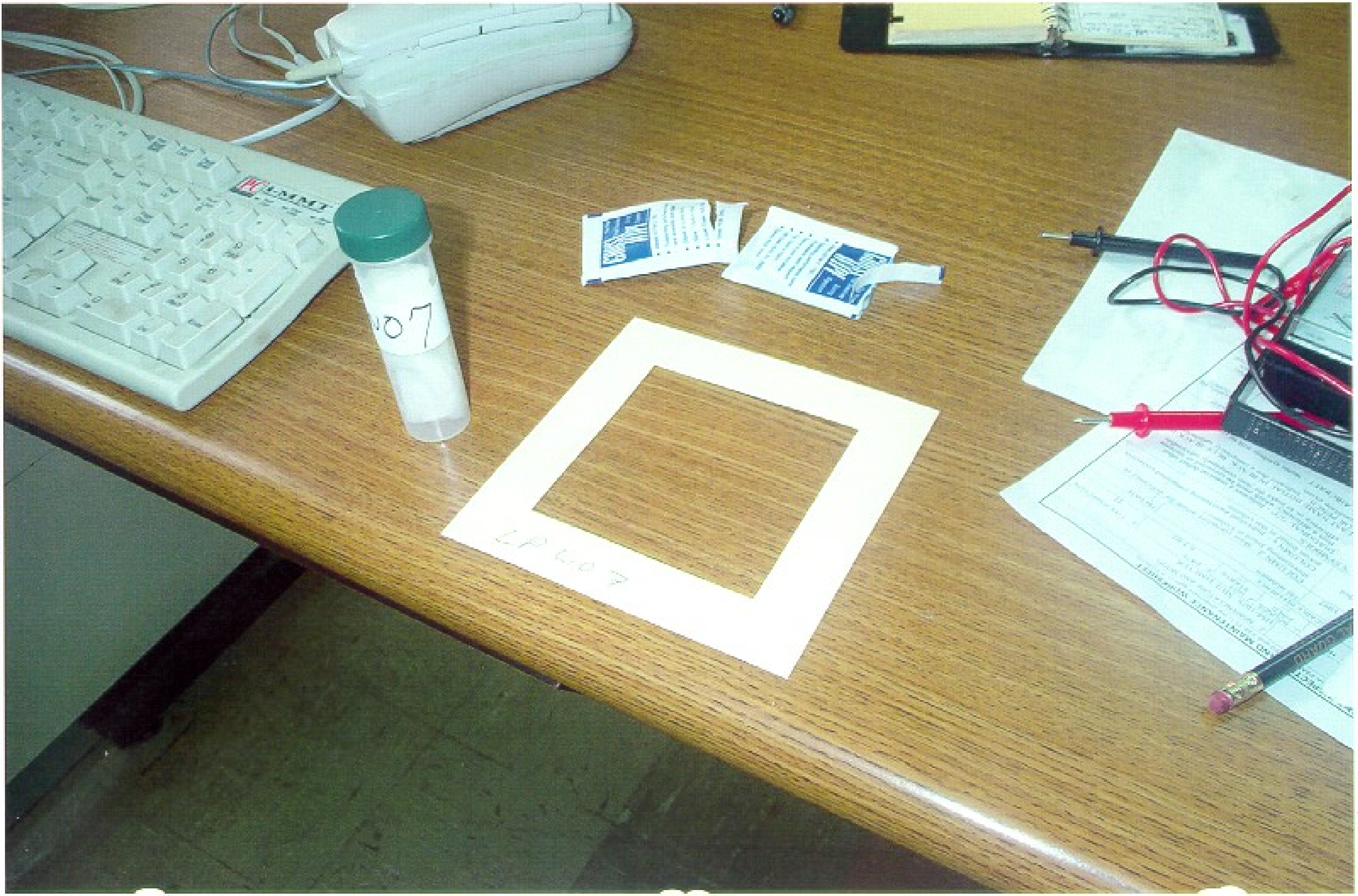

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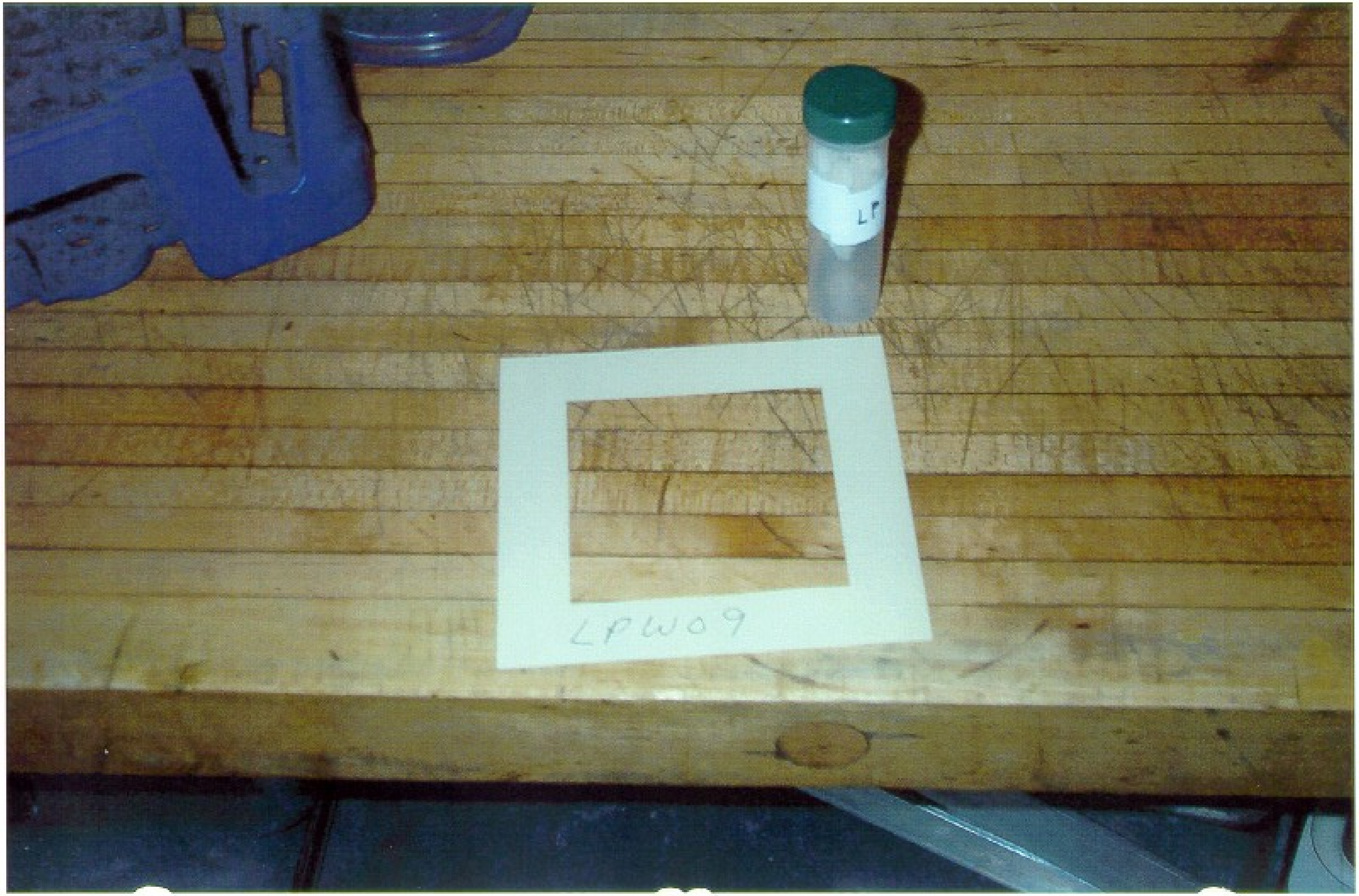

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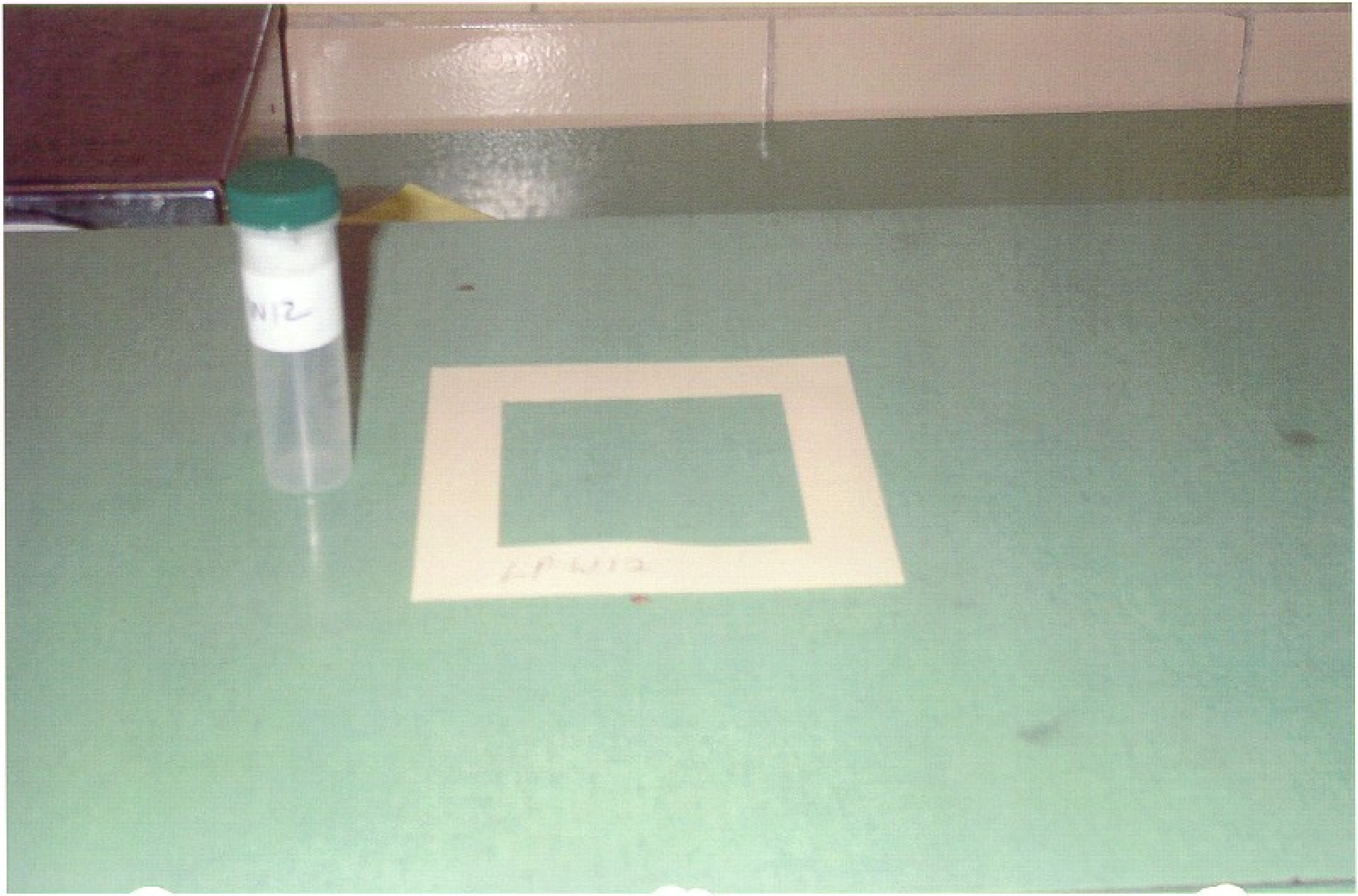

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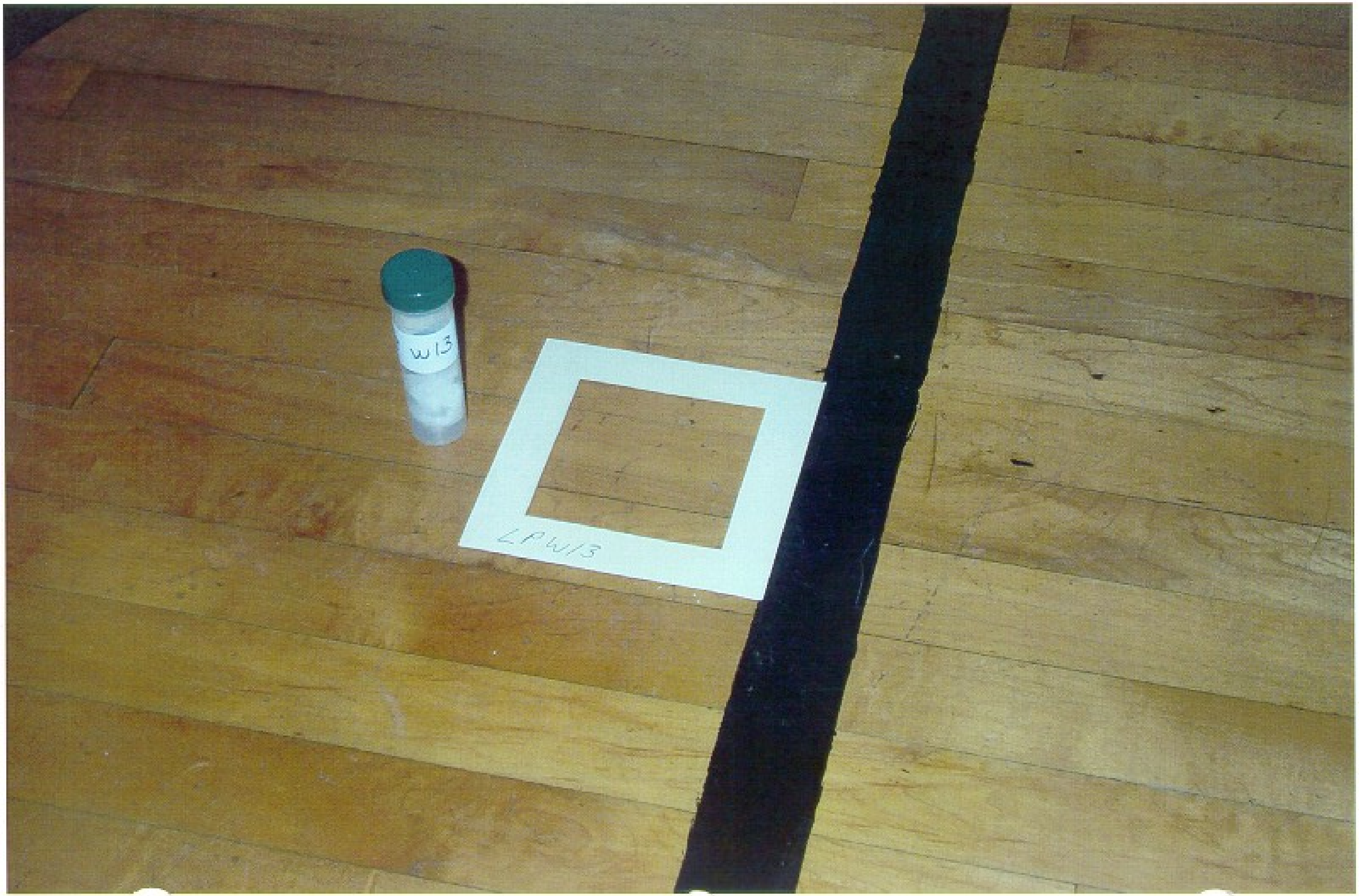

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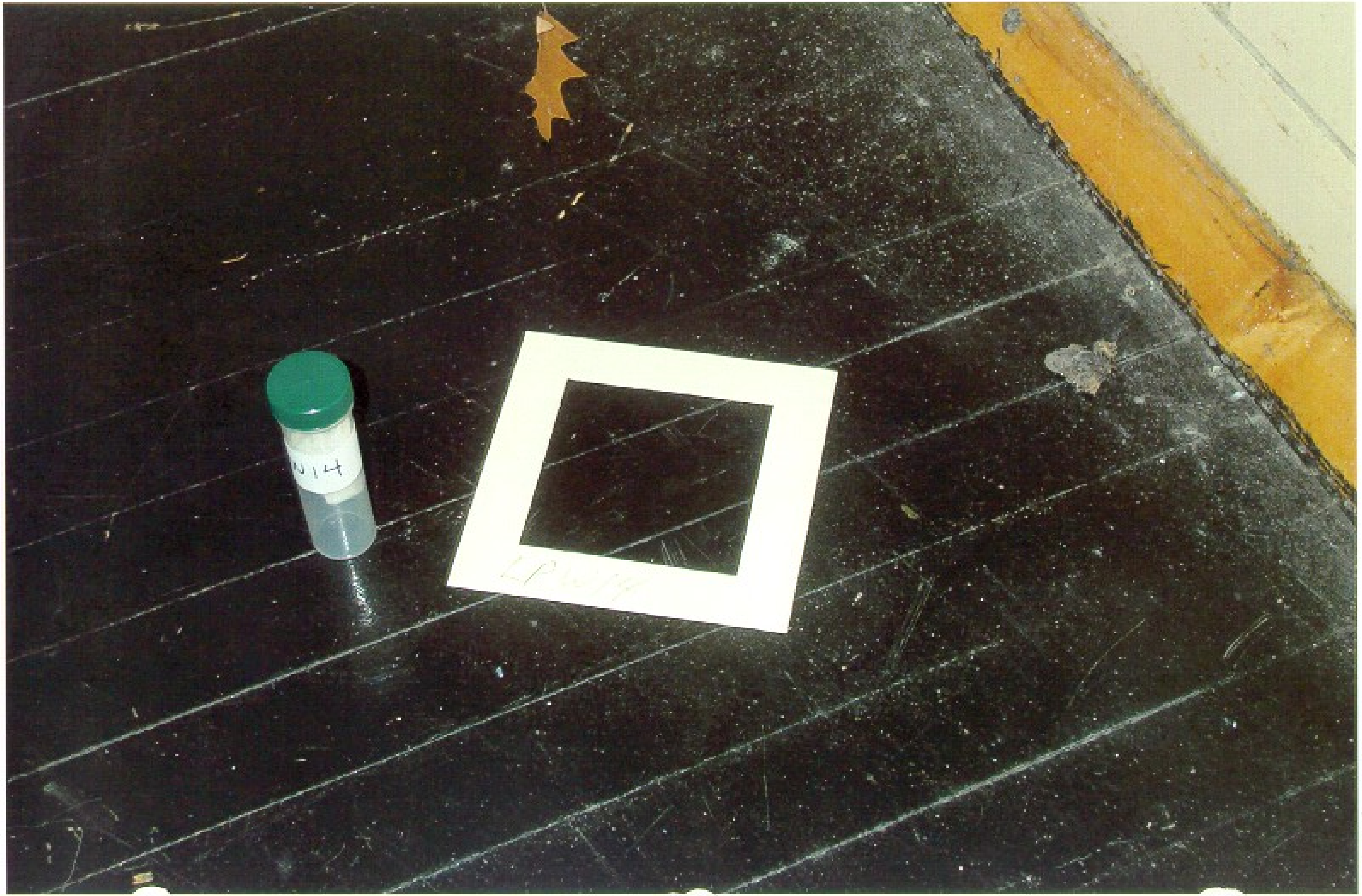

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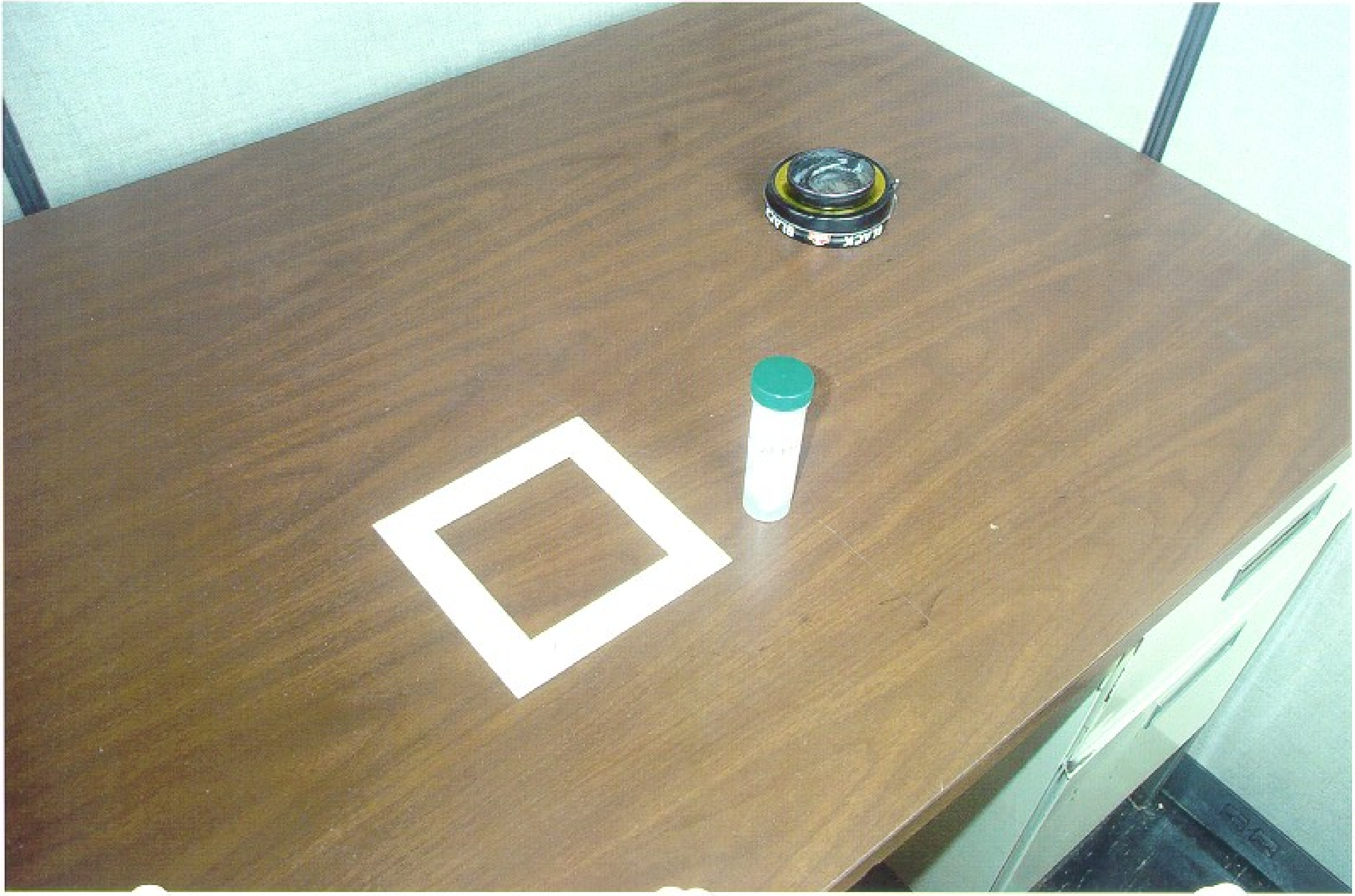

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MDARNG Facilities IH Baseline Surveys Brig GEN William Smallwood Armory,
La Plata, MD Project No. 55-ML-01ED-03

APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

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			Indoor Range Info						
Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Floor	Conc. (ug/ft²)
LP W01	LaPlata	LaPlata		Yes		Unknown	Lounge/Training Room table wall next to door to drill room	First	11
LP W02	LaPlata	LaPlata					Lounge/Training Room floor by door to lobby	First	<2.8
LP W03	LaPlata	LaPlata					Lounge/Training Room chair by window	First	7
LP W04	LaPlata	LaPlata					Motor Maintenance Bay table top by outside door	First	1400
LP W05	LaPlata	LaPlata					Motor Maintenance Bay floor center by office door	First	88
LP W06	LaPlata	LaPlata					Motor Maintenance Bay floor by press	First	18
LP W07	LaPlata	LaPlata					Motor Maintenance Office desk top	First	5.5
LP W08	LaPlata	LaPlata					Motor Maintenance Office floor center far wall	First	<2.8
LP W09	LaPlata	LaPlata					Kitchen table top	First	3.4
LP W10	LaPlata	LaPlata					Former Range Lobby floor in front of cage door	First	38
LP W11	LaPlata	LaPlata					Former Range Lobby floor behind door to lobby	First	81
LP W12	LaPlata	LaPlata					Drill Room starter table top	First	<2.8
LP W13	LaPlata	LaPlata					Drill Room floor center court	First	4
LP W14	LaPlata	LaPlata					Drill Room floor by door to former range lobby door	First	9.9
LP W15	LaPlata	LaPlata					Locker Room table top near front of building	Second	5.7
LP W16	LaPlata	LaPlata					Locker Room floor center of room	Second	<2.8

Lead Sample Numbers	Type of Sample	Location	Floor	Photo Numbers
LP W01	Wipe	Lounge/Training Room table wall next to door to drill room	First	0940
LP W02	Wipe	Lounge/Training Room floor by door to lobby	First	0941
LP W03	Wipe	Lounge/Training Room chair by window	First	0942
LP W04	Wipe	Motor Maintenance Bay table top by outside door	First	0943
LP W05	Wipe	Motor Maintenance Bay floor center by office door	First	0945
LP W06	Wipe	Motor Maintenance Bay floor by press	First	0946
LP W07	Wipe	Motor Maintenance Office desk top	First	0946
LP W08	Wipe	Motor Maintenance Office floor center far wall	First	0947
LP W09	Wipe	Kitchen table top	First	0948
LP W10	Wipe	Former Range Lobby floor in front of cage door	First	0949
LP W11	Wipe	Former Range Lobby floor behind door to lobby	First	0950
LP W12	Wipe	Drill Room starter table top	First	0951
LP W13	Wipe	Drill Room floor center court	First	0952
LP W14	Wipe	Drill Room floor by door to former range lobby door	First	0953
LP W15	Wipe	Locker Room table top near front of building	Second	0954
LP W16	Wipe	Locker Room floor center of room	Second	0955
30903RR01	Air	Lounge/Training Room bar	First	0938
30903RR02	Air	Former Range Lobby cage door	First	0939

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Client:	US Army - CHPPM	**Job Name:**	MD Arng/LaPlata	**Chain Of Custody:**	117743
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	09/18/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	22-Sep-03
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0368062	LP Blank 1	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368063	LP W01	Furnace	Wipe	****	0.108	2.79	ug/ft²		11	ug/ft²	
0368064	LP W02	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/ft²	
0368065	LP W03	Furnace	Wipe	****	0.108	2.79	ug/ft²		7	ug/ft²	
0368066	LP W04	Flame	Wipe	****	0.108	111.52	ug/ft²		1400	ug/ft²	
0368067	LP W05	Furnace	Wipe	****	0.108	69.70	ug/ft²		88	ug/ft²	
0368068	LP W06	Furnace	Wipe	****	0.108	2.79	ug/ft²		18	ug/ft²	
0368069	LP Blank 2	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368070	LP W07	Furnace	Wipe	****	0.108	2.79	ug/ft²		5.5	ug/ft²	
0368071	LP W08	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/ft²	
0368072	LP W09	Furnace	Wipe	****	0.108	2.79	ug/ft²		3.4	ug/ft²	
0368073	LP W10	Furnace	Wipe	****	0.108	6.97	ug/ft²		38	ug/ft²	
0368074	LP Blank 3	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368075	LP W11	Furnace	Wipe	****	0.108	69.70	ug/ft²		81	ug/ft²	
0368076	LP W12	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/ft²	
0368077	LP W13	Furnace	Wipe	****	0.108	2.79	ug/ft²		4	ug/ft²	
0368078	LP W14	Furnace	Wipe	****	0.108	2.79	ug/ft²		9.9	ug/ft²	
0368079	LP W15	Furnace	Wipe	****	0.108	2.79	ug/ft²		5.7	ug/ft²	
0368080	LP Blank 4	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368081	LP W16	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/ft²	

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP Accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples.

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	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	22-Sep-03
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable   mg/Kg = parts per million (ppm) by weight   mg/L = parts per million (ppm)
%Pb = percent lead by weight   ug = micrograms   ug/L = parts per billion (ppb)
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Analyst: G. Carney / J. Willoughby   **Technical Manager:** G Edward Carney

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Client:	US Army - CHPPM	**Job Name:**	MD Arng/LaPlata	**Chain Of Custody:**	117743
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	9/18/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	18-Sep-03
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Final Result			Comments
0368062	LP Blank 1	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368063	LP W01	Furnace	Wipe	****	0.108	2.79	ug/ft^2		11	ug/ft^2	
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0368067	LP W05	Furnace	Wipe	****	0.108	69.70	ug/ft^2		88	ug/ft^2	
0368068	LP W06	Furnace	Wipe	****	0.108	2.79	ug/ft^2		18	ug/ft^2	
0368069	LP Blank 2	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368070	LP W07	Furnace	Wipe	****	0.108	2.79	ug/ft^2		5.5	ug/ft^2	
0368071	LP W08	Furnace	Wipe	****	0.108	2.79	ug/ft^2	<	2.8	ug/ft^2	
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0368077	LP W13	Furnace	Wipe	****	0.108	2.79	ug/ft^2		4	ug/ft^2	
0368078	LP W14	Furnace	Wipe	****	0.108	2.79	ug/ft^2		9.9	ug/ft^2	
0368079	LP W15	Furnace	Wipe	****	0.108	2.79	ug/ft^2		5.7	ug/ft^2	
0368080	LP Blank 4	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368081	LP W16	Furnace	Wipe	****	0.108	2.79	ug/ft^2	<	2.8	ug/ft^2	

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Client:	US Army - CHPPM	**Job Name:**	MD Arng/LaPlata	**Chain Of Custody:**	117743
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	9/18/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[redacted] Non-Responsive t
		P.O. Number:	Not Provided	**Report Date:**	18-Sep-03
Attention:	[redacted] Non-Respo				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

J Willoughby

Analyst: G. Carney / J. Willoughby **Technical Manager:** G Edward Carney

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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 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	17-Sep-03

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0368002	30903RR01	Flame	Air	216	N/A	13.89	ug/m³	<	14	ug/m³	
0368003	30903RR02	Flame	Air	206	N/A	14.56	ug/m³	<	15	ug/m³	
0368004	30903RR03BL	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	
0368005	30903RR04	Flame	Air	226	N/A	13.27	ug/m³	<	13	ug/m³	
0368006	30903RR05	Flame	Air	222	N/A	13.51	ug/m³	<	14	ug/m³	
0368007	30903RR06BL	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.

Analyst: Jodi Willoughby **Technical Manager:** G Edward Carney

MDARNG Facilities IH Baseline Surveys Brig GEN William Smallwood Armory, La Plata, MD Project No. 55-ML-01ED-03

APPENDIX E

REFERENCES

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APPENDIX E

REGULATIONS AND STANDARDS

1. Title 29, Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration, current ed. http://www.osha.gov/comp-links.html.

2. Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program, August 19, 1998. http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf.

3. AR 40-5, Medical Service, Preventive Medicine, 15 October 1990. http://www.usapa.army.mil/pdffiles/r40_5.pdf.

4. AR 385-10, The Army Safety Program, 29 February 2000. http://www.usapa.army.mil/pdffiles/r385_10.pdf.

5. DA PAM 40-503, Medical Services, Industrial Hygiene Program, 30 October 2000. http://www.usapa.army.mil/pdffiles/p40_503.pdf.

6. Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs), American Conference of Governmental Industrial Hygienists (ACGIH), current ed.

7. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 62-2002, Ventilation for Acceptable Indoor Air Quality.

8. RP-1-1993, Office Lighting, ANSI/ESNA.

MDARNG Facilities IH Baseline Surveys Brig GEN William Smallwood Armory, La Plata, MD Project No. 55-ML-01ED-03

APPENDIX F

LEAD CLEANING GUIDANCE

Chapter 14: Cleaning

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
3. Have sufficient cleaning equipment and supplies *before* beginning work.
4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
13. Paint or otherwise seal treated surfaces and interior floors.
14. Conduct a clearance examination (see Chapter 15).
15. If clearance is not achieved, repeat the final cleaning.

16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.

17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.

18. Cleaning equipment list:

    - HEPA vacuums.
    - Detergent.
    - Waterproof gloves.
    - Rags.
    - Sponges.
    - Mops.
    - Buckets.
    - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
    - 6-mil plastic bags.
    - Debris containers.
    - Waste water containers.
    - Shovels.
    - Rakes.
    - Water-misting sprayers.
    - 6-mil polyethylene sheeting (or equivalent).

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Chapter 14: Cleaning

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris *and* dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?
- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

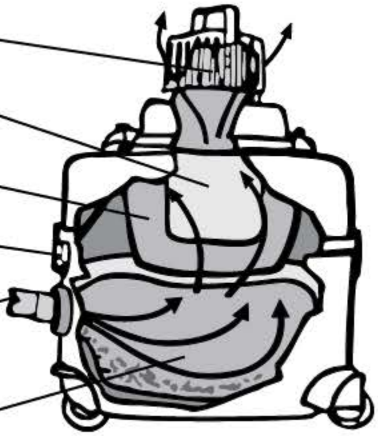
To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards *and* were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and pre-filter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the pre-filter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

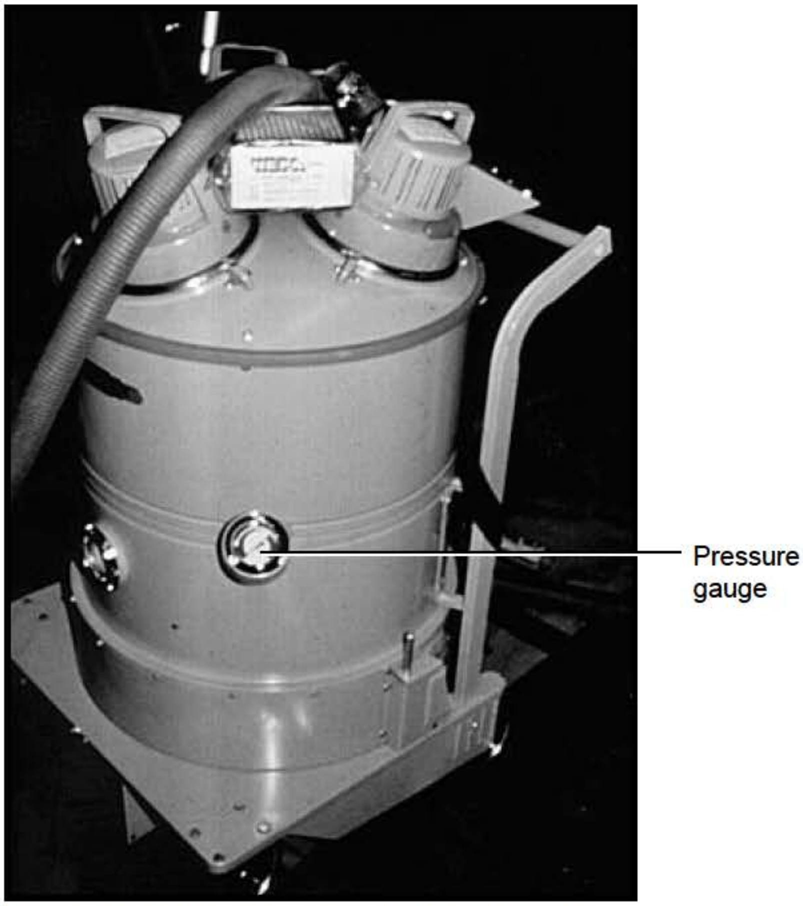
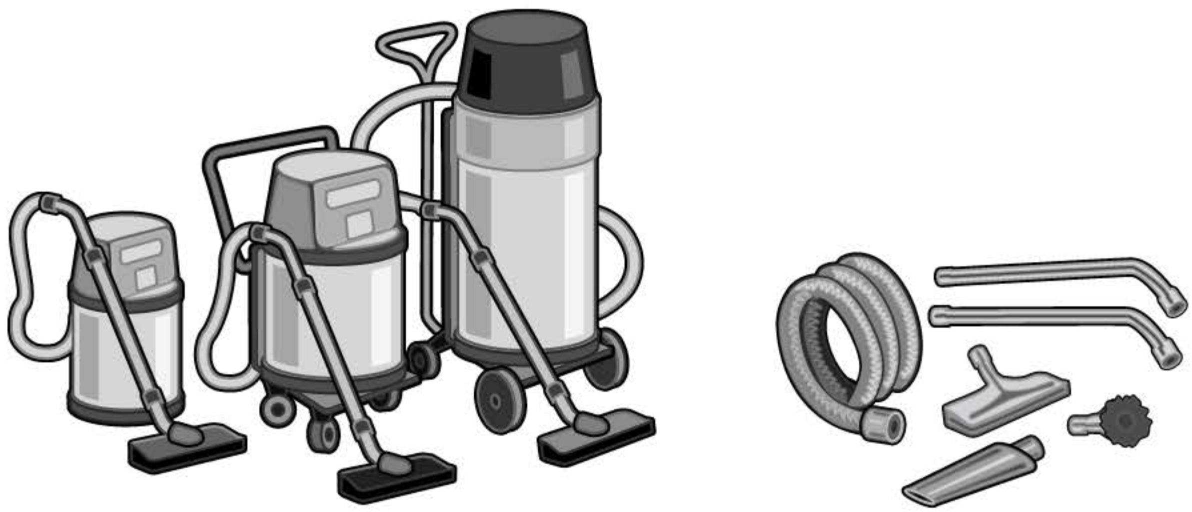


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

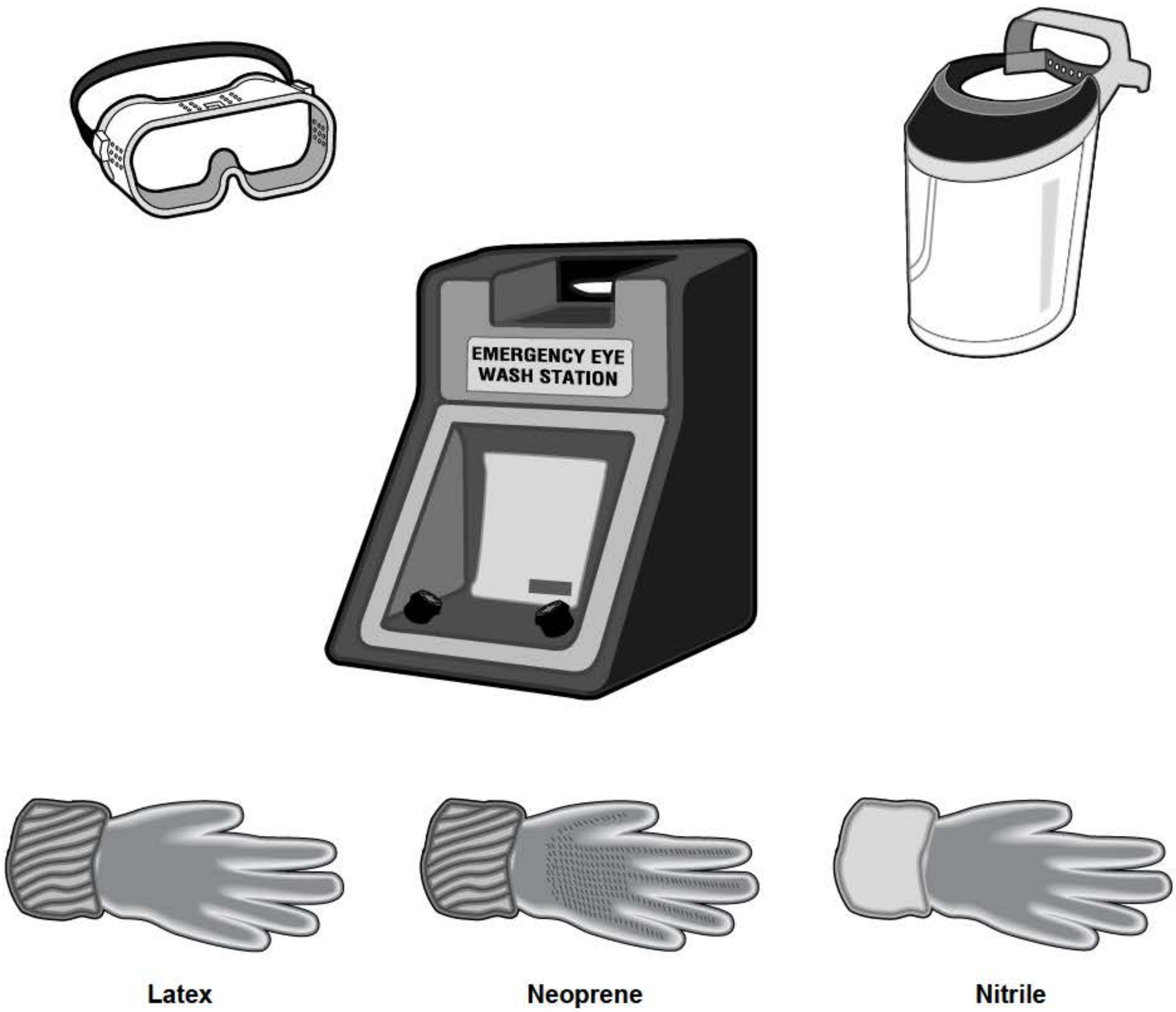
Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

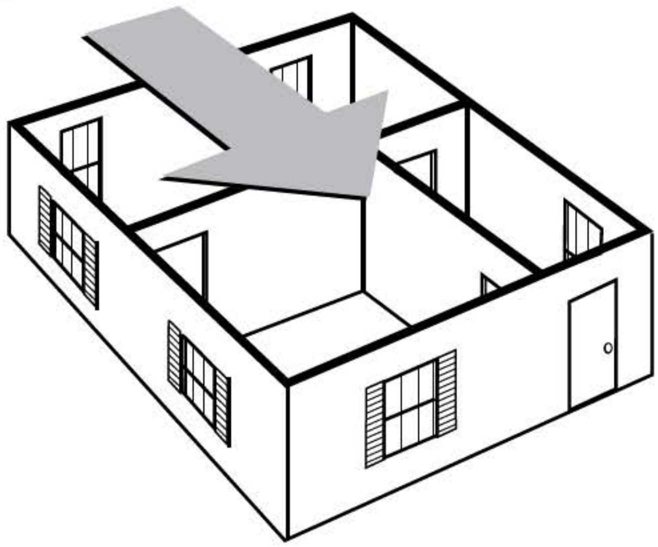
Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

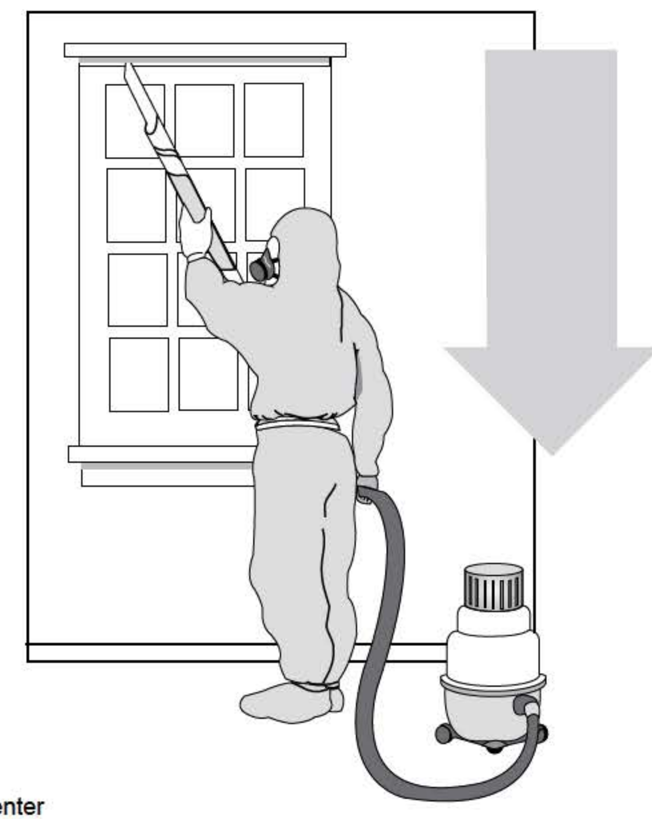
- First, the area is HEPA vacuumed.

Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on, and work down to the floor. Do every inch of the windows, especially the window troughs.



Courtesy: Alice Hamilton Occupational Health Center

- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.

Rubber Cone

Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

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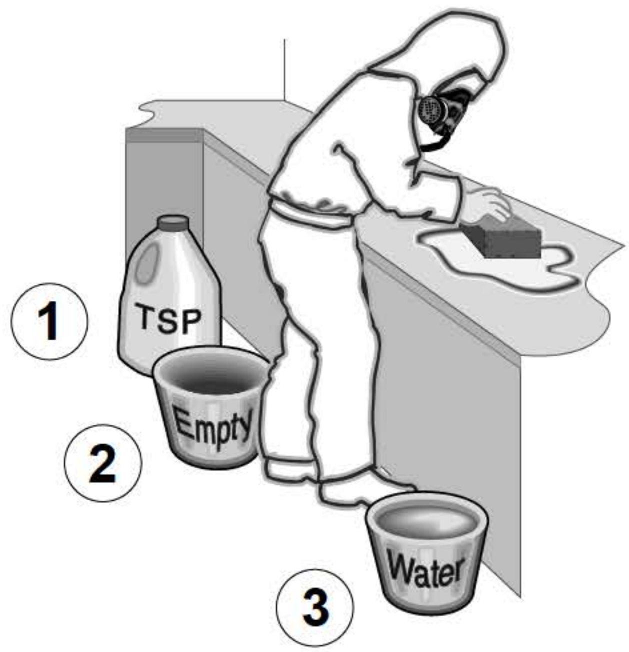
Figure 14.4c (continued)

Wash all surfaces with suitable detergents
Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces

Wet Mop Floor

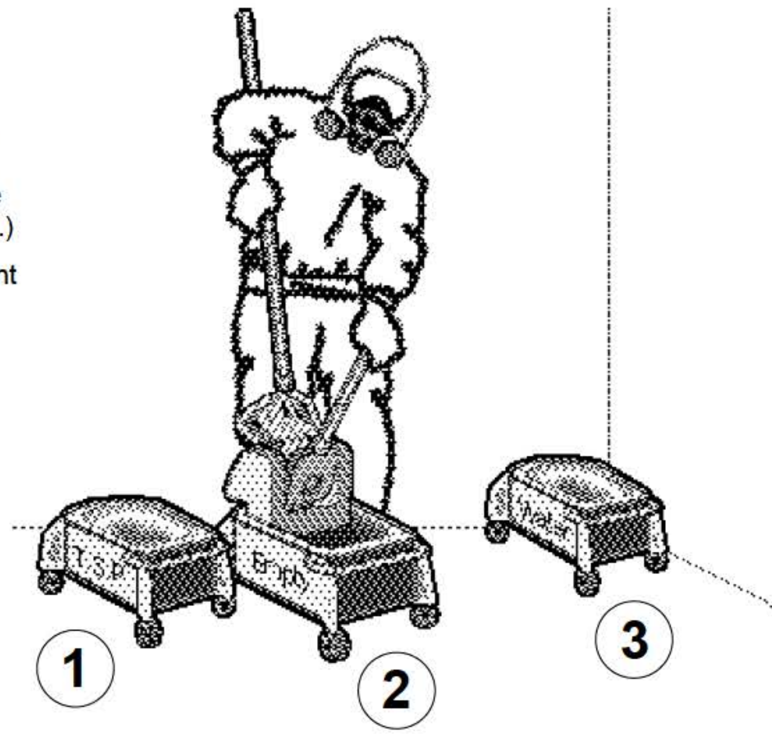
Don't Dry Sweep

Figure 14.4c (continued)

Use the 3-Bucket System.

To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.



Squeeze out the mophead in empty bucket #2. Return to bucket #1 for more detergent solution and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

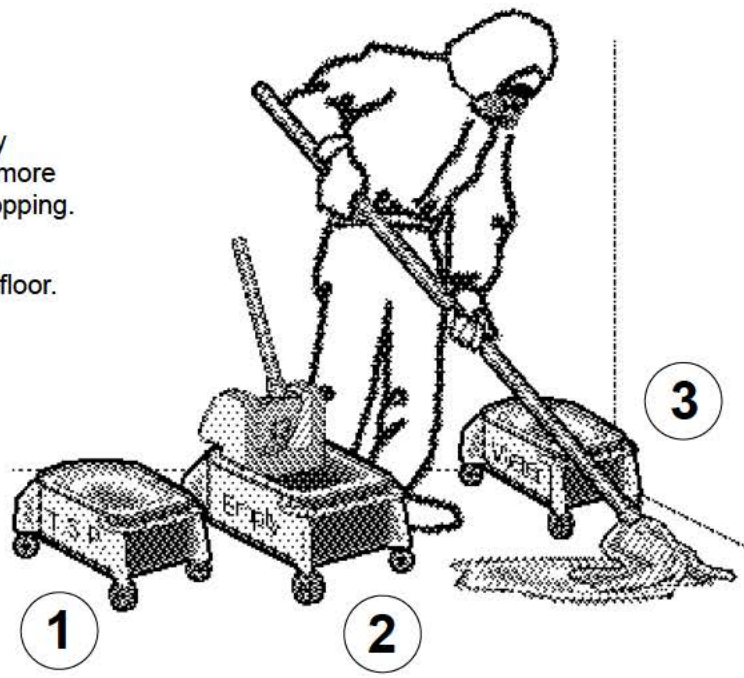
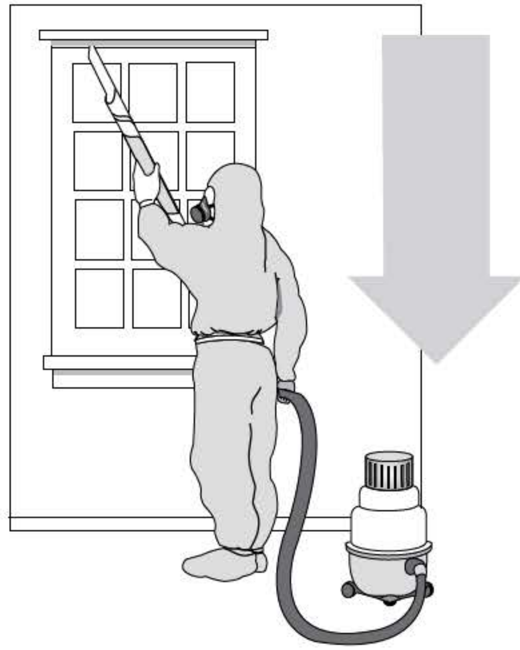


Figure 14.4d (continued)

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.

Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water *and cleaned.* All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).

Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This

option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dust-retaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table 14.1 Initial Cleaning Wipe-Test Failure Rates for Various Abatement Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)

and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993).

These *Guidelines* do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Cycle Number	Mass Removal Efficiency Percentages			
	Cleaning Method			
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.8	67.0	29.4
5	59.3	88.9	72.1	32.5
6	61.6	91.2	74.4	34.9
7	63.8	93.1	76.4	36.5
8	67.5	95.4	77.5	38.1
9	67.5	97.7	78.7	40.1
10	67.2	100.0	80.2	41.7
11		102.3	80.2	41.7
12		104.6	84.1	44.8
13		104.6	84.5	46.8
14		103.8	84.5	48.4
15				49.6
16				50.8
17				52.4
18				53.6
19				54.4
20				55.2

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) *Effectiveness of Clean-up Techniques for Leaded Paint Dust*

MDARNG Facilities IH Baseline Surveys Brig GEN William Smallwood Armory, La Plata, MD Project No. 55-ML-01ED-03

APPENDIX G

MOLD GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

TG 277
FEBRUARY 2002

USACHPPM
Readiness thru Health

ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

Concern about indoor exposure to mold has been increasing as the public becomes more aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions.

This document provides the best and most current guidance for remediation of clean water damage (<48 hours) and mold contamination (>48 hours) into one resourceful Army guide. This guide has been designed to provide information to facilities management individuals who have little or no experience with mold remediation. It will assist them in making a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to develop or evaluate an in-house remediation plan or evaluate a remediation plan submitted by an outside contractor. If an outside contractor is employed, they must have experience cleaning up mold. Check their references, and have them follow the recommendations presented in this document, EPA guidelines, and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). A multi-disciplinary team approach to mold concerns is best. A health and safety professional, such as an industrial hygienist, should be consulted prior to any remediation activities to assist in the project.

Molds produce tiny spores to reproduce. Mold spores float through the indoor and outdoor air continually. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or uncorrected. There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.(1)

In all situations, the underlying cause of water accumulation must be rectified or mold growth will recur. Any initial water infiltration should be stopped and clean up began immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth. (Refer to Appendix A for detailed guidance on clean water damage response). If the source of water is elevated humidity, actions to maintain the relative humidity levels below 60% to inhibit mold growth should be taken (2). Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

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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.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft^2) follow Level I guidance for PPE and containment and for a areas (>10 ft^2) follow Medium (Level II) or when greater than 100 ft^2 follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended (7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and removed in double-bagged 6-mil plastic. When a decontamination room is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

All areas should be left dry and visibly free from contamination and debris.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air (4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If remediation sampling is necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HAZARD COMMUNICATION

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.

3. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water Damage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£	
Water-Damaged Material†	**Actions**
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours§	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans.
Ceiling tiles	• Discard and replace.
Cellulose insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	• Discard and replace.

Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling should be pried away from wall for drying

£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.
These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

† If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

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APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

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APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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TG 277

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*[1] will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination[2].

Safety Tips While Investigating and Evaluating Mold and Moisture Problems[3]

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate[1].

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems[3].

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination[2].

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air[4]. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control[4]."

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program. For further mold assistance, contact USACHPPM, Industrial Hygiene Field Services Program, DSN 584-3118 or (410) 436-3118.

References

1. USACHPPM Technical Guide 277, *Army Facilities Management Information Document on Mold Remediation Issues*, February 2002.

2. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

3. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

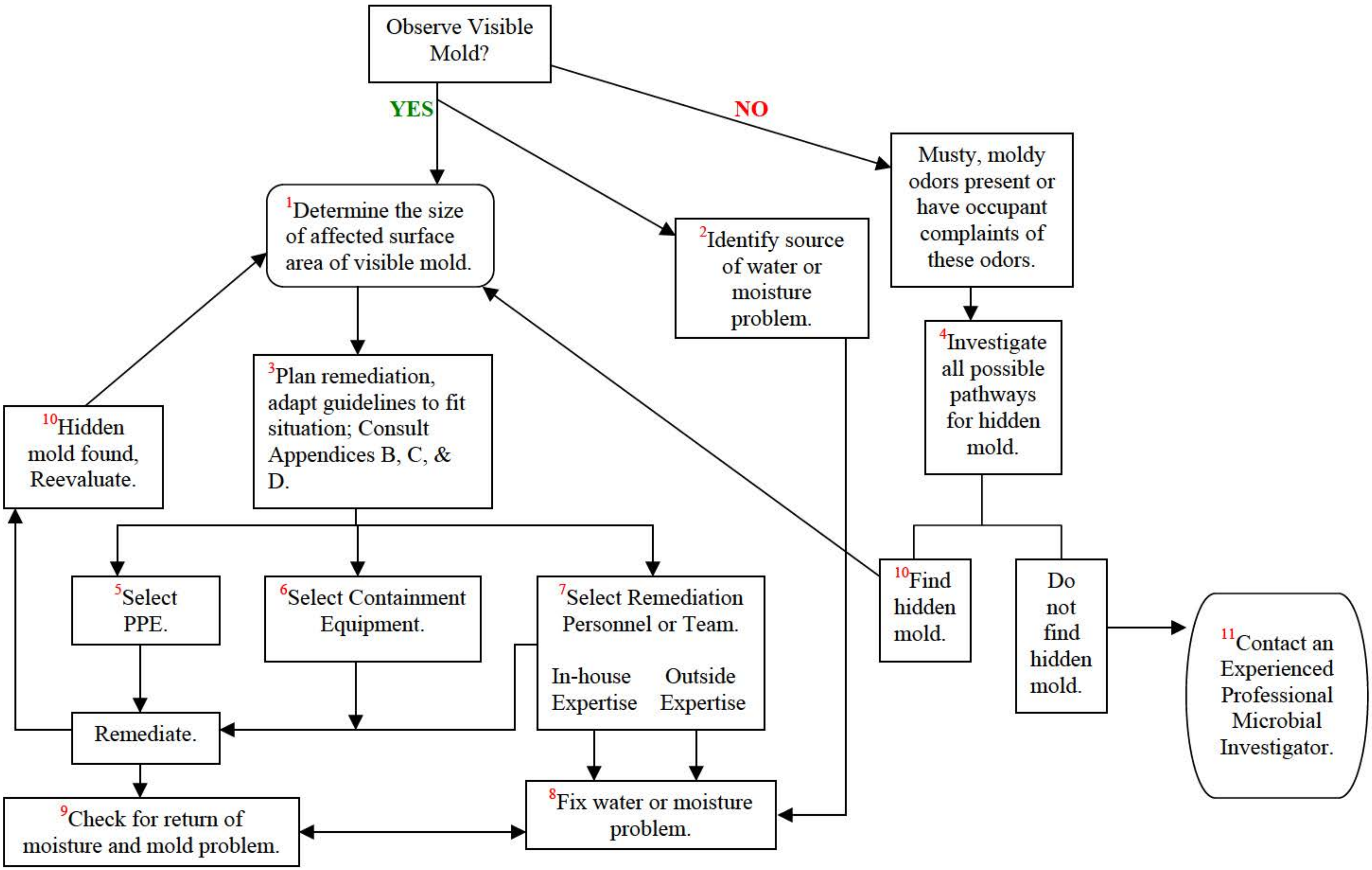
7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

MOLD INVESTIGATION DECISION LOGIC



MOLD INVESTIGATION DECISION LOGIC NOTES:

1. Roughly approximate the total surface area of visible mold. Categorization of the remediation levels are sometimes borderline, so when trying to decide the category to apply, consider the extent of visible growth, such as a heavy blanket of growth on the surface, to barely visible. If heavy growth is apparent, consider moving up to the next level of protection.

2. Do not skip this step. Address the source of water or moisture problem or the mold will simply reappear.

3. Always protect the health and safety of the building occupants and remediators.

4. Mold may be hiding on the backside of drywall, vinyl wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads. Check walls behind furniture, pipe chases and utility tunnels, porous thermal or acoustic liners inside ductwork, or check the rafters (due to roof leaks or insufficient insulation)[3].

5. Utilize appendices B and C for remediation guidance. Use your best judgment during investigations, if not disturbing the mold you may need minimal to no PPE. Do not alarm building occupants unnecessarily, but protect yourself as necessary.

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities[3]. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

®TYVEK, DuPont de Nemours, E.I., & Co., Wilmington, DE.

APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

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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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Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene Survey

National Guard Facility
LaPlata Armory

Prepared For:	National Guard Bureau Region North IH 301-IH Old Bay Lane Havre de Grace, MD 21078
Survey Location:	LaPlata Armory 14 West Hawthorne Drive LaPlata, MD 20646
Prepared By:	Analytical Laboratory Services, Inc. 3544 North Progress Avenue Suite 100 Harrisburg, PA 17110
Survey Date:	September 15, 2010
Report Date:	October 7, 2010
ALSI Project #:	1009596

Non-Responsive [redacted]

Director, Environmental Health & Safety

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on September 15, 2010, at the LaPlata Armory located at 14 West Hawthorne Drive, LaPlata, MD 20646. The survey was performed by Ms [redacted] and Mr [redacted]

1. Lead surface, air and bulk samples were collected. All sample results were less than recommended guidelines or regulatory standards.

2. Lighting levels met the minimum recommended guidelines in all locations evaluated.

3. Indoor air quality parameters of temperature, relative humidity carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment. Temperature was higher than the recommended criteria of 79 degrees F in most tested locations. There is no central air-conditioning system in this facility.

4. Some areas of suspected asbestos containing floor tile are damaged. Damaged floor tile and mastic should be properly abated and repaired. Vinyl floors should be regularly waxed.

5. Water damaged ceilings and active roof leaks are present. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced. Areas such as ceilings and walls with water damage should be repaired. On the exterior of the building there are cracks in the concrete and mortar is missing. This provides a pathway for water infiltration to occur. These areas should be repaired. In the Boiler Room there is rusting and water damage on the ceiling. This is reported to be caused by condensation. This area should be investigated for potential solutions to the condensation and water infiltration problem.

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Section 2.0 Operation Description & Observations

The LaPlata Armory is mainly an administrative facility with offices, training and storage areas. There were approximately 4 full-time employees stationed at this facility at the time of this survey.

The building was initially constructed in 1954. The exterior is brick. The interior walls are primarily concrete block and drywall. The floors are wood and concrete with some vinyl floor tile.

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 on the day of this survey. Heat is provided via a boiler-fired heating system.

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 classroom. There is no child-care facility in the building.

Overall housekeeping was good. Areas were clean and well kept.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared properly designed. Personnel had supportive chairs.

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Section 3.0 Noise Survey

Employees were not performing tasks that provided excessive noise levels. Therefore, noise exposure monitoring was not conducted.

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Section 4.0 Lead Testing

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/m^3	Surface ug/ft^2	Paint Chip %Pb
1	Drill Hall	<4.3		
2	RNCO Office	<4.1		
3	Blank	<3 (ug)		
4	Entry Lobby - Floor		<110	
5	Room 107 Lounge - Tabletop		<110	
6	Drill Hall - Floor (Center)		<110	
7	Drill Hall - Tabletop		<110	
8	Drill Hall - Ceramic Tile Ledge on Wall		130	
9	Room 120 - Window Sill		<110	
10	Room 116 RNCO Office - Radiator Grill		<110	
11	Converted Firing Range – Floor		<110	
12	Converted Firing Range - Window Sill		<110	
13	Converted Firing Range - Top of Older Locker		<110	
14	Floor Outside Converted Firing Range		<110	
15	Attached Garage - Floor		<110	
16	Gym - Window Sill		<110	
17	Locker Room 201 - Floor		<110	
18	Blank		<12 (ug)	
19	RNCO Office - Wall			0.16
Criteria		50	200	0.5

Key: **Bolded** results exceed listed criteria

Lead surface, air and bulk samples were collected. All sample results were less than recommended guidelines or regulatory standards.

The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for

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Environmental Chemicals," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 ug/m^3. In fact, no detectable level of lead was identified in the air samples collected.

Deteriorated paint was observed in a many 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 Drill Hall. This paint was found to be 0.16% lead. This is below the HUD definition of lead-based paint (0.5%).

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Section 5.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. K070003). The light meter was last calibrated on November 26, 2009. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Room 107 Lounge	112.5	30-50	Yes
Kitchen	73.4	50	Yes
Attached Garage	90.9	75	Yes
Classroom - Converted Firing Range	71.4	30-50	Yes
Drill Hall	44.1	30-50	Yes
Room 120	110.6	30-50	Yes
Room 118	61.6	30-50	Yes
Room 116 RNCO Office	153.3	30-50	Yes
Room 207 Gym	44.4	30	Yes
Locker Room 201	56.6	5	Yes
Entry Lobby	144.2	5	Yes

Lighting levels met the minimum recommended guidelines in all locations evaluated.

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Section 6.0 Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7565X (Serial # 0839020). The IAQ Meter was last calibrated in March 2010.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2007). ASHRAE specifies temperature and relative humidity ranges for human comfort (ASHRAE 55-2004). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60% in occupied areas.

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 78.1 to 82.6 degrees F with relative humidity readings ranging from 34.4% to 41.8%. During the survey, carbon dioxide (CO_2) levels ranged from 363 ppm to 588 ppm within the facility compared to an outdoor CO_2 level of 382 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,082 ppm (382 ppm + 700 ppm). Carbon monoxide (CO) ranged from 0.1 – 0.6 ppm.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	86.9	30.3	382	0.5
Room 107 Lounge	**81.1**	34.4	382	0.6
Kitchen	**80.4**	36.4	378	0.5
Attached Garage	**80.1**	37.8	385	0.6
Classroom – Converted Firing Range	78.1	38.0	375	0.4
Drill Hall	**82.6**	35.7	363	0.1
Room 120	**80.8**	41.8	431	0.7
Room 118	**80.6**	38.5	413	0.3
Room 116 RNCO Office	**81.0**	39.0	588	0.2
Room 207 Gym	**80.4**	37.5	449	0.2
Locker Room 201	79.9	37.2	400	0.3
Entry Lobby	**80.1**	37.6	383	0.3
Criteria	**73.0-79.0**	**30-60**	**<1,082**	**<9.0**

Key: **Bolded** results exceed listed criteria

Temperature was higher than the recommended criteria of 79 degrees F in all but one indoor location sampled. There is no central air conditioning system present. Windows and doors were open. There were a few window units or portable air-conditioners in use. Outdoor conditions were hot with moderate relative humidity. Relative humidity indoors was within the recommended guideline of 30-60%.

Carbon dioxide levels did not exceed the recommended ceiling of 1,082 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. The visual inspection revealed the following items that may be potential sources of poor IAQ:

1. Water damaged ceilings and active roof leaks are present. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

2. Roof leaks or water damage was observed in:

    - Room 21;
    - RNCO Office;
    - Converted Firing Range (Classroom)

3. On the exterior of the building there are cracks in the concrete and mortar is missing. This provides a pathway for water infiltration to occur. These areas should be repaired.

4. In the Boiler Room there is rusting and water damage on the ceiling. This is reported to be caused by condensation. This area should be investigated for potential solutions to the condensation and water infiltration problem.

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Section 7.0 Suspect Asbestos Containing Building Materials

Suspect asbestos containing materials (ACM) 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 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:

1. 9" x 9" black and green floor tile and mastic are present in the facility. Approximately 5,000 ft^2 was observed. Floor tile in the locker room is in poor condition and should be abated or repaired. Floor tile should be regularly waxed and a proper coating of wax should be maintained on the surface of the tile.

2. Suspected asbestos containing pipe insulation was observed in the bathrooms. This was in good condition.

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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 parking. Overhead vehicle exhausts are present but have been disconnected and are no longer used. There is a storage area that was previously used as a battery storage room. It is no longer used for battery storage.

The battery room has one exhaust fan located on the wall inside the room. The air ventilates directly outside. The battery storage room has a floor space of 108 ft^2. According to Unified Federal Code 3-410-01FA (UFC) regulations, the battery room should have 1.5 CFM per square of floor space or 162 CFM if it is used for battery storage. Based upon the data gathered, the ventilation rate inside the battery room was a total of 374 CFM. This is above the recommended value for a battery storage room. Ventilation is adequate should this area be used as a battery storage room.

The overhead vehicle exhaust should be repaired and utilized if vehicle maintenance activity occurs that involves operation of vehicles inside the building.

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Section 9.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Analytical Laboratory Services, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A. Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	LaPlata	**Chain Of Custody:**	508813
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	LaPlata, MD	**Date Submitted:**	9/20/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	9/27/2010
				Report Date:	9/27/2010

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
1080630	1009596-1	Flame	Air	704	N/A	4.3	ug/m³	<3	<4.3	ug/m³	
1080631	1009596-2	Flame	Air	733	N/A	4.1	ug/m³	<3	<4.1	ug/m³	
1080632	1009596-3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1080633	1009596-19	Flame	Paint Chip	****	N/A	0.011	%Pb		0.16	%Pb	
1080634	1009596-4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080635	1009596-5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080636	1009596-6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080637	1009596-7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080638	1009596-8	Flame	Wipe	****	0.108	110	ug/ft²	14	130	ug/ft²	
1080639	1009596-9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080640	1009596-10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080641	1009596-11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080642	1009596-12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080643	1009596-13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080644	1009596-14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080645	1009596-15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080646	1009596-16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080647	1009596-17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080648	1009596-18	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	LaPlata	**Chain Of Custody:**	508813
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	LaPlata, MD	**Date Submitted:**	9/20/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	9/27/2010 **Report Date:** 9/27/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)
%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accreditation applies only to paint chip, wipe, and soil samples.

Analyst: Lom Butnik Technical Manager: G Edward Carney

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Page 1 of 2

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Focused on Results www.amalab.com
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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **508813**

p 1/2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: LaPlato, MD
2. Job Location: [redacted]
3. Job #: [redacted] W912K6-09-A-0003
4. Contact Person [redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due: ______
☐ 24 Hours Time Due: ______
Comments: ______

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day + 9/27/10
☐ 2 Day Date Due: ______
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ [redacted] @analyticallab.com
☐ [redacted] @us.army.mil
☐ [redacted] @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ______ (QTY)
☐ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ______ (QTY)
☐ NIOSH 7402 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ______ (QTY)
☐ EPA Point Count ______ (QTY)
☐ NY State-Friable 198.1 ______ (QTY)
☐ Grav. Reduction ELAP 198.6 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM __ (Qual) PLM __ (Quan) PLM/TEM __ (Qual) PLM/TEM __ (Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ______ (QTY)
☐ NY State PLM/TEM ______ (QTY)
☐ Residual Ash ______ (QTY)
TEM Dust
☐ Qual. (presfabs) Vacuum/Dust ______ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
☐ Quan. (s/area) Dust D6480-99 ______ (QTY)
TEM Water
☐ Qual. (presfabs) ______ (QTY)
☐ ELAP 198.2/EPA 100.2 ______ (QTY)
☐ EPA 100.1 ______ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ______ °C)

Metals Analysis
☒ Pb Paint Chip 1 (QTY)
☒ Pb Dust Wipe (wipe type ghost) 15 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ______ (QTY)
☐ Pb TCLP ______ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ______) ______ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

@us.army.mil

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER	PAINT	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
1009596-1	Drill Hall	9/15	703.8					X		X							Date/Time: Contact: By:
1009596-2	RNCO Office		732.7					X		X							
1009596-3	Blank		0					X		X							
1009596-4	Entry Lobby Fl			100cm²				X				X					
1009596-5	Rm 107 Lounge tabletop							X				X					Date/Time: Contact: By:
1009596-6	Drill Hall Fl Center							X				X					
1009596-7	Drill Hall Tabletop							X				X					
1009596-8	Drill Hall Ceramic tile on wall							X				X					
1009596-9	Rm 120 Win. Sill							X				X					Date/Time: Contact: By:
1009596-10	Rm 116 RNCO Office Radiator Grill							X				X					
1009596-11	Converted Fire Range Floor							X				X					
1009596-12	Converted Fire Range Windowsill	↓						X				X					

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 9 / 20 / 10 @ ____ Via: UPS By (Print): Nicole Maxwell Sign: [signature]
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ____ / ____ / ____ Time: ______ Initials: ______
4. Comments: ______

Page 2 of 2

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AMA Analytical Services, Inc.
Focused on Results   www.amalab.com
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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 508813 p. 2/2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SL State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: LaPlata
2. Job Location: LaPlata, MD
3. Job #: ______ P.O. #: W912K6-09-A-0003
4. Contact Person: [redacted]
5. Submitted by: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be prescheduled)
☐ Immediate Date Due: ______
☐ 24 Hours Time Due: ______
Comments: ______

NORMAL BUSINESS HOURS
☐ Immediate ☐ Next Day ☐ 2 Day
☐ 3 Day ☒ 5 Day + Date Due: ______
☐ Results Required By Noon (Every Attempt Will Be Made to Accommodate)

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ Email [redacted] @us.army.mil
☐ Fax [redacted] @us.army.mil
☐ Verbal

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ______ (QTY)
☐ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ______ (QTY)
☐ NIOSH 7402 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ______ (QTY)
☐ EPA Point Count ______ (QTY)
☐ NY State Friable 198.1 ______ (QTY)
☐ Grav. Reduction ELAP 198.6 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM __(Qual) PLM __(Quant) PLM/TEM __(Qual) PLM/TEM __(Quant)

TEM Bulk
☐ ELAP 198.4 (Chatfield ______ (QTY)
☐ NY State PLM/TEM ______ (QTY)
☐ Residual Ash ______ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
☐ Quan. (s/area) Dust D6480-99 ______ (QTY)
TEM Water
☐ Qual. (pres/abs) ______ (QTY)
☐ ELAP 198.2/EPA 100.2 ______ (QTY)
☐ EPA 100.1 ______ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ______ °C)

Metals Analysis
☐ Pb Paint Chip ______ (QTY)
☐ Pb Dust Wipe (wipe type ______) ______ (QTY)
☐ Pb Air ______ (QTY)
☐ Pb Soil/Solid ______ (QTY)
☐ Pb TCLP ______ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ______) ______ (QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
☐ Spore-Trap ______ (QTY) ☐ Surface Vacuum Dust ______ (QTY)
☐ Surface Swab ______ (QTY) ☐ Culturable ID Genus (Media ______) ______ (QTY)
☐ Surface Tape ______ (QTY) ☐ Culturable ID Species (Media ______) ______ (QTY)
☐ Other (Specify ______) ______ (QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1009596-13	Covered Fire Ready (Upper Locker)	9/15		100cm²				X				X				
1009596-14	Fl Outside Covered Fire Ready							X				X				
1009596-15	Attached Garage Fl							X				X				
1009596-16	Gym Window Sill							X				X				
1009596-17	Rm 201 Lockers Fl							X				X				
1009596-18	Blank			0cm²				X				X				
1009596-19	PNCO Office-Wall			—				X			X					

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______

LABORATORY STAFF ONLY (CUSTODY)
1. Date/Time RCVD: ____ / ____ / ____ @ ____ Via: ______ By (Print): ______ Sign: ______
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ____ / ____ / ____ Time: ______ Initials: ______
4. Comments: ______

Appendix B. Photographs

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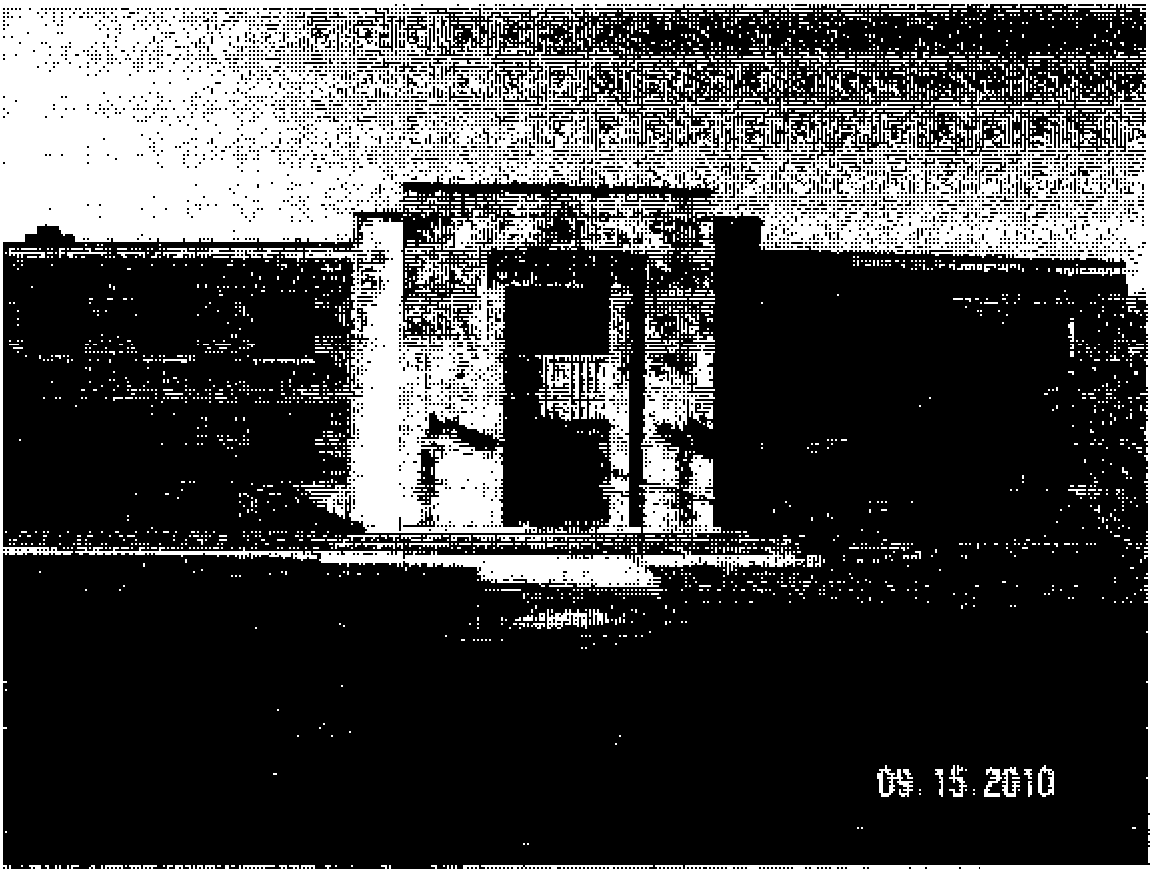
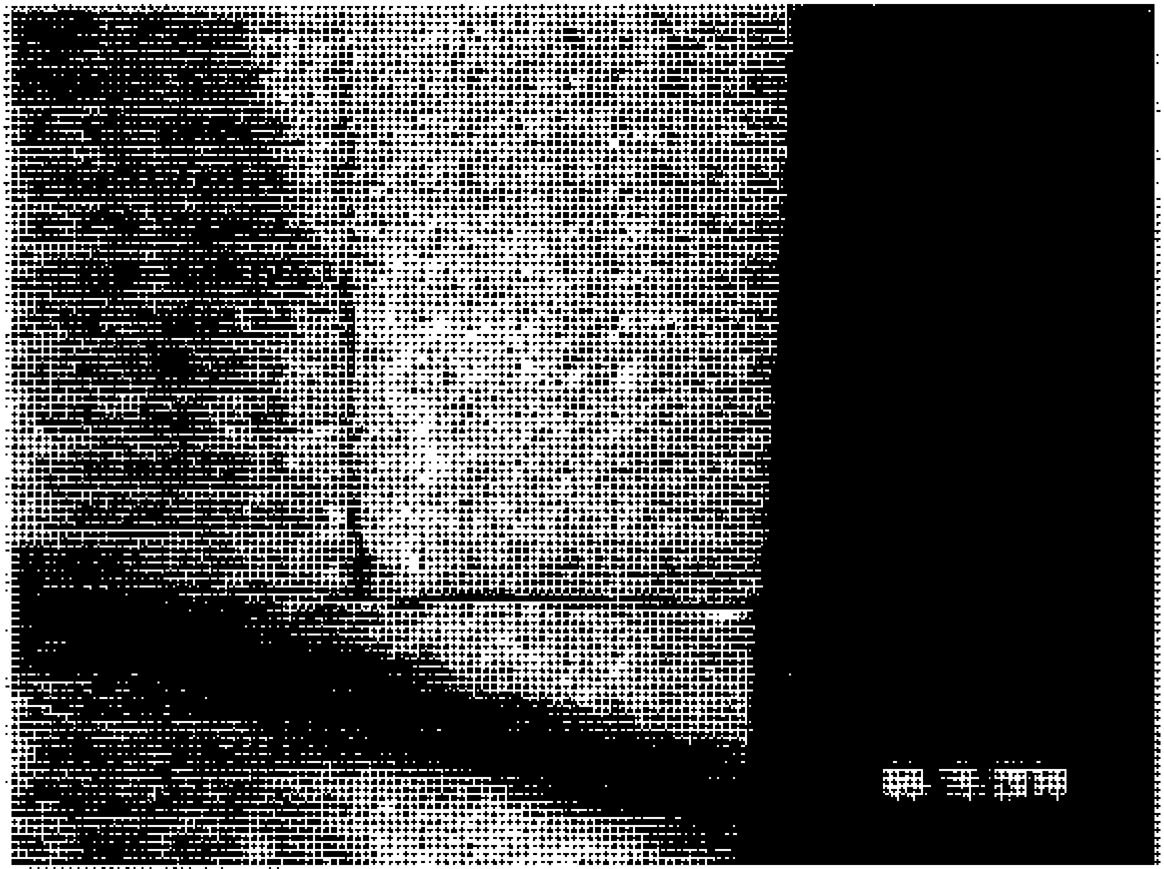
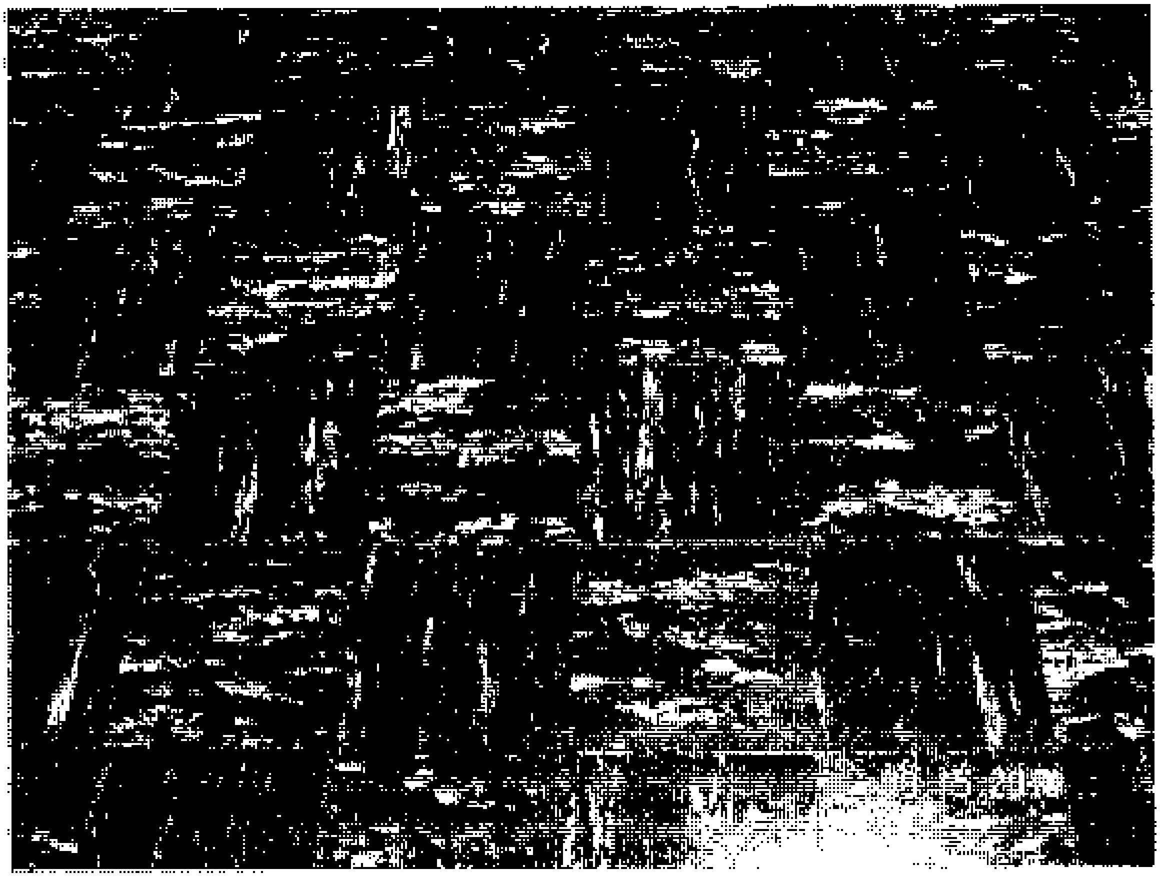


La Plata MD
Exterior



Exterior Front of Building – Cracks and Damage to Mortar on Concrete



La Plata MD
Lounge – 9x9 Vinyl Floor Tile (Black and Green)

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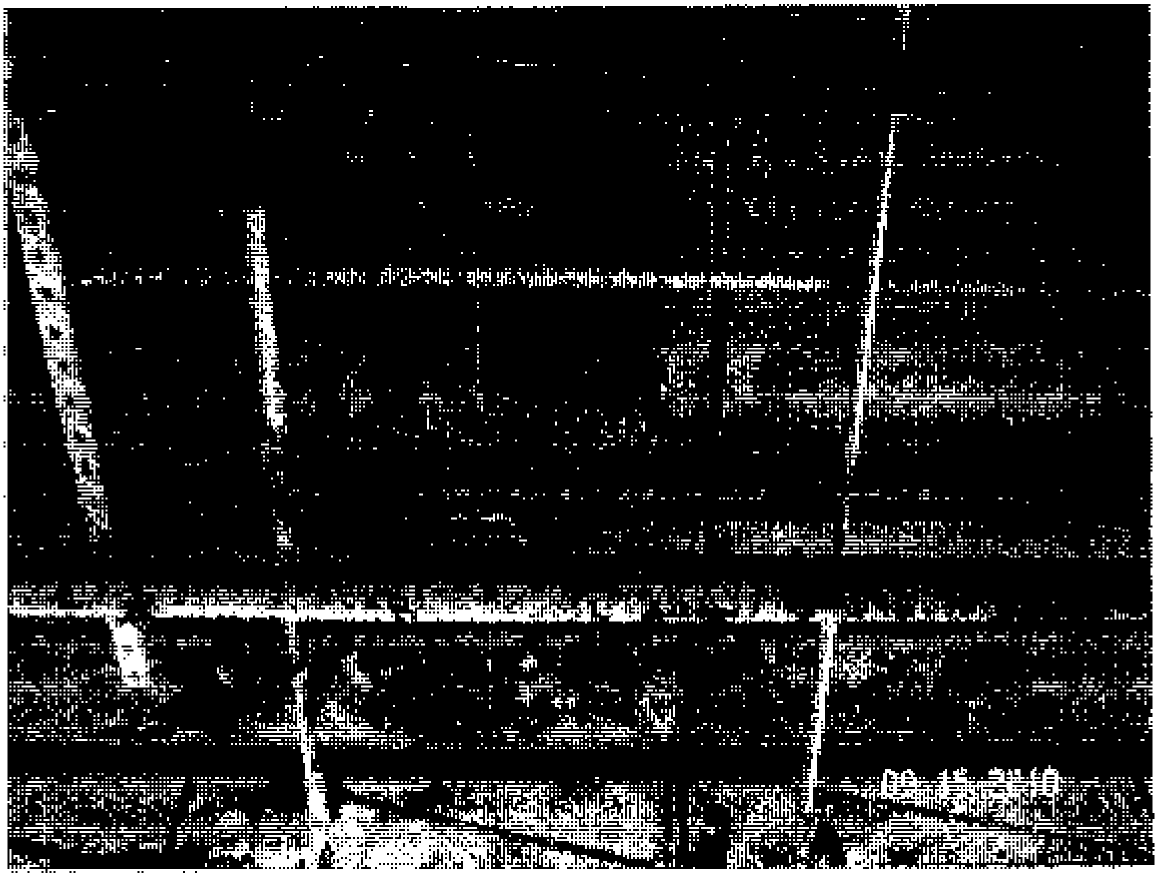
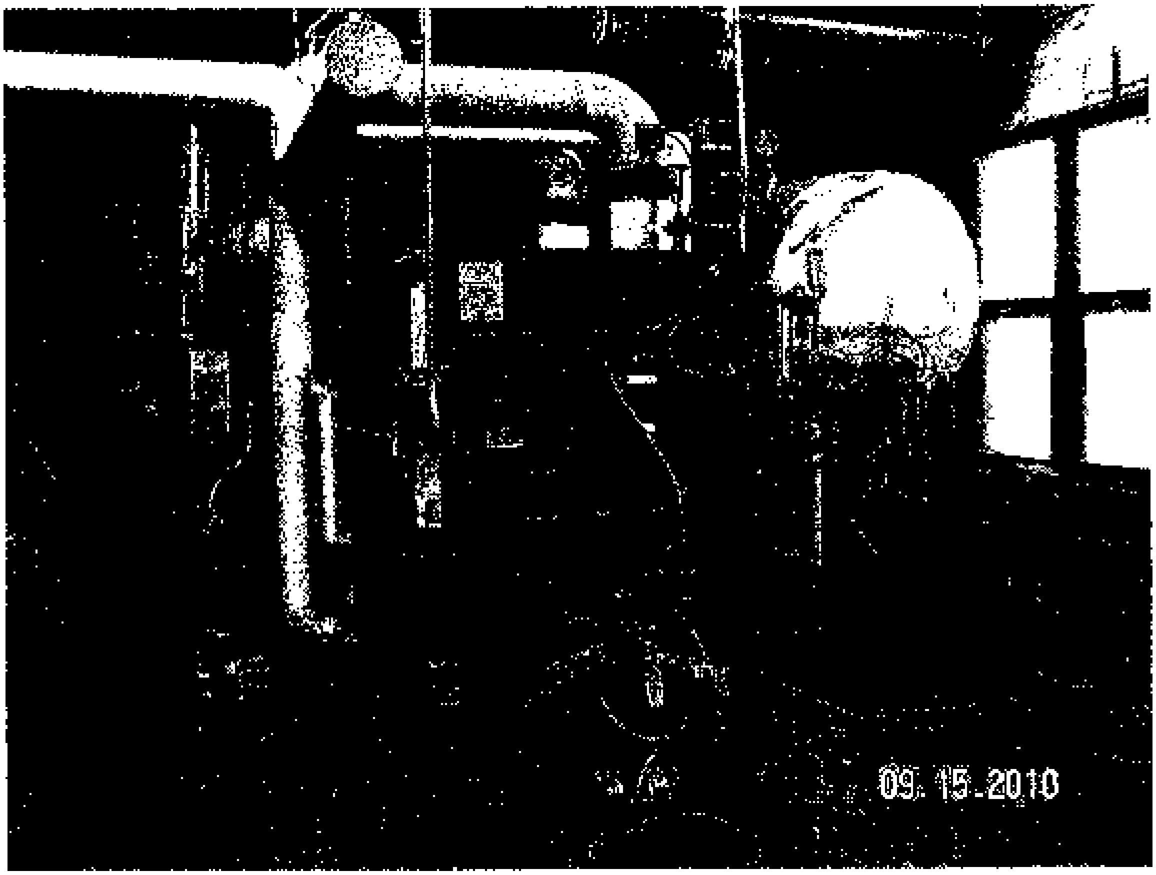


La Plata MD

Boiler Room Ceiling   Chipping and Peeling Paint and Rust on Pipes from Condensation from Boiler



La Plata MD
Boiler

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La Plata MD
Attached Garage

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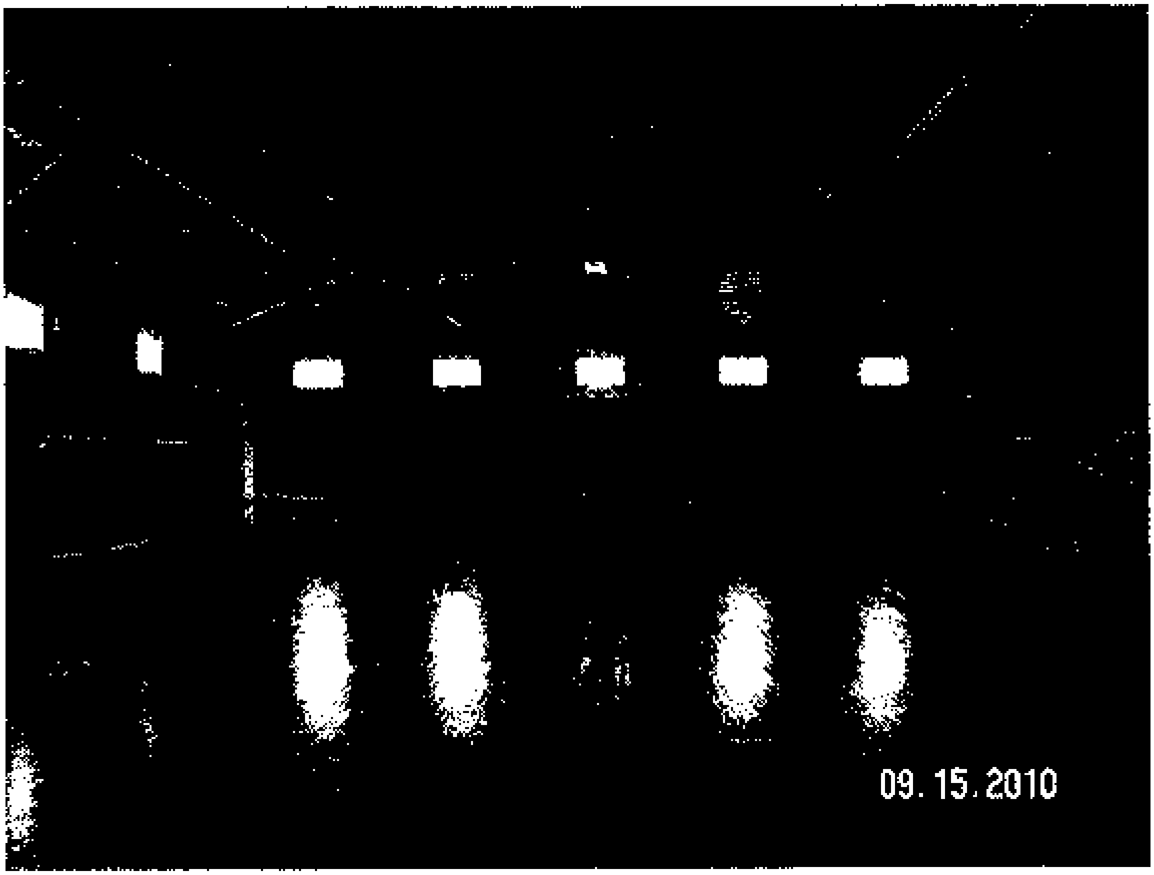
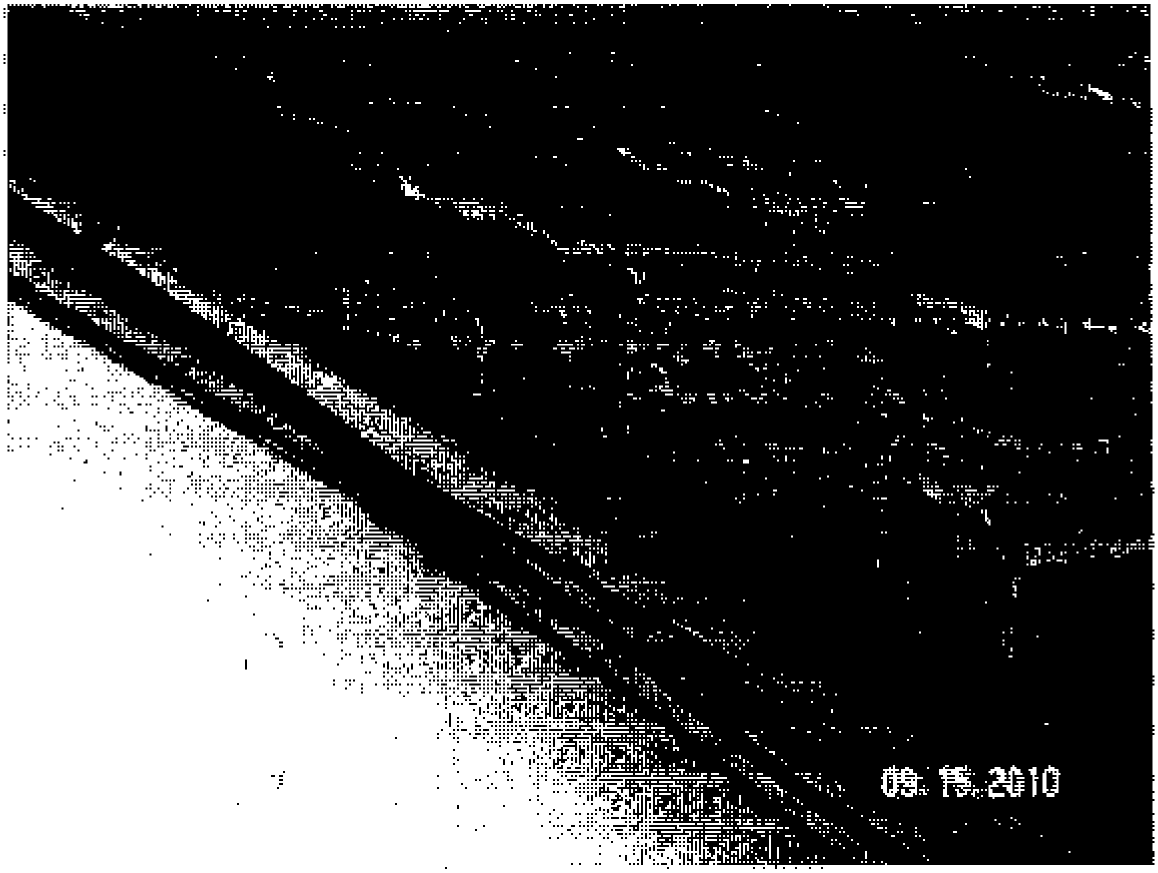
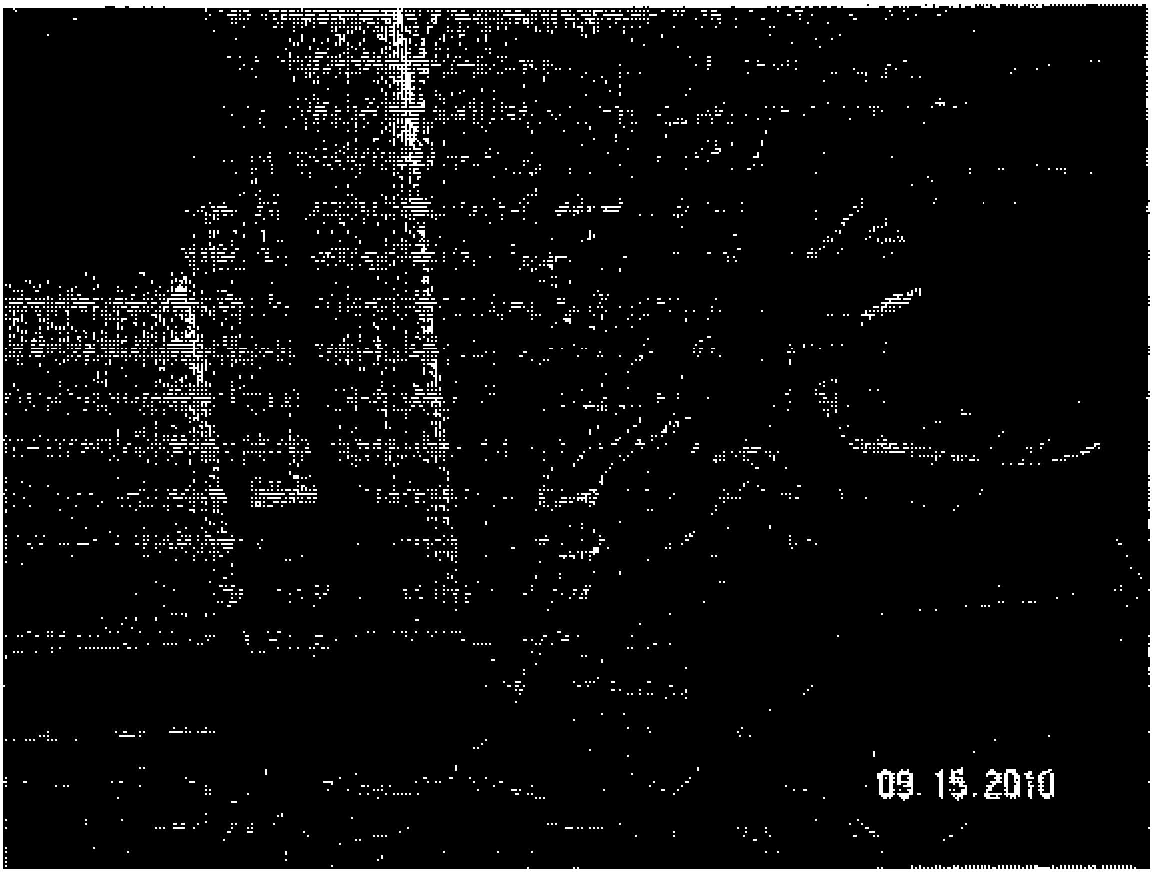


La Plata MD
Drill Hall



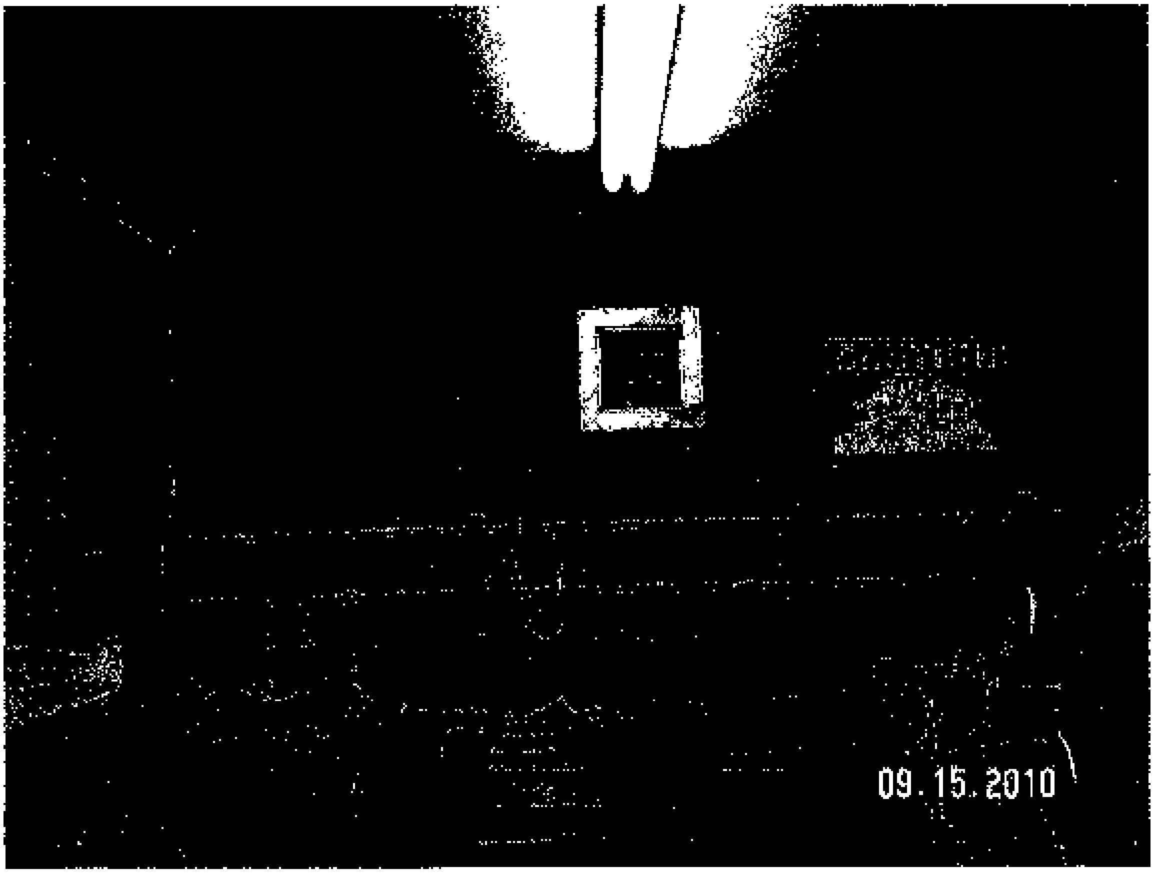
La Plata MD
Room 120 Water Damage and Chipping/Peeling Paint on Ceiling

Command Office - Hole in Ceiling from Roof Leak

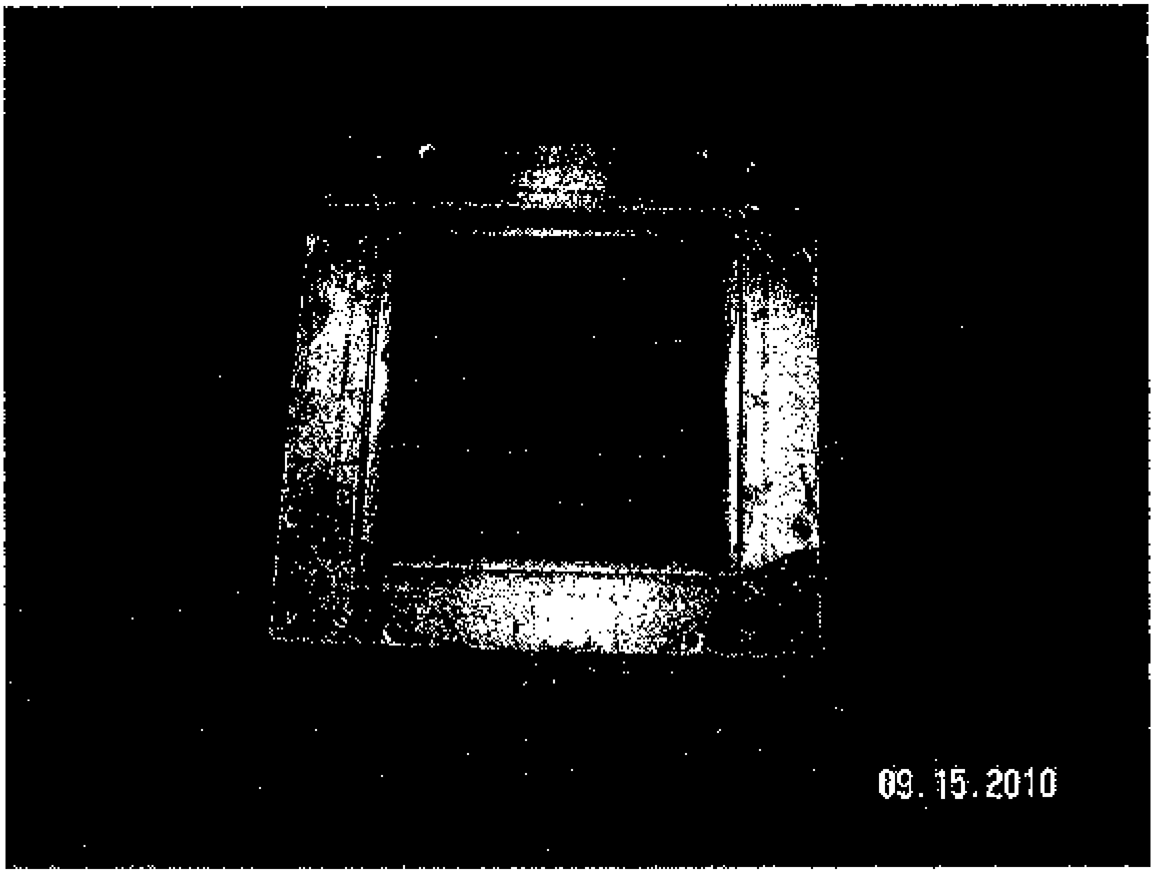


La Plata MD
RNCO Office Significant Water Damage and Chipping/Peeling Paint on Wall

La Plata MD
2nd Floor Room 201   Damaged 9x9 Vinyl Floor Tile and Exposed Mastic from Ongoing Water Infiltration



La Plata MD
Battery Room (Not in Use)



La Plata MD
Battery Room – Exhaust Fan

BEST AVAILABLE COPY

Appendix C. Floor Plan

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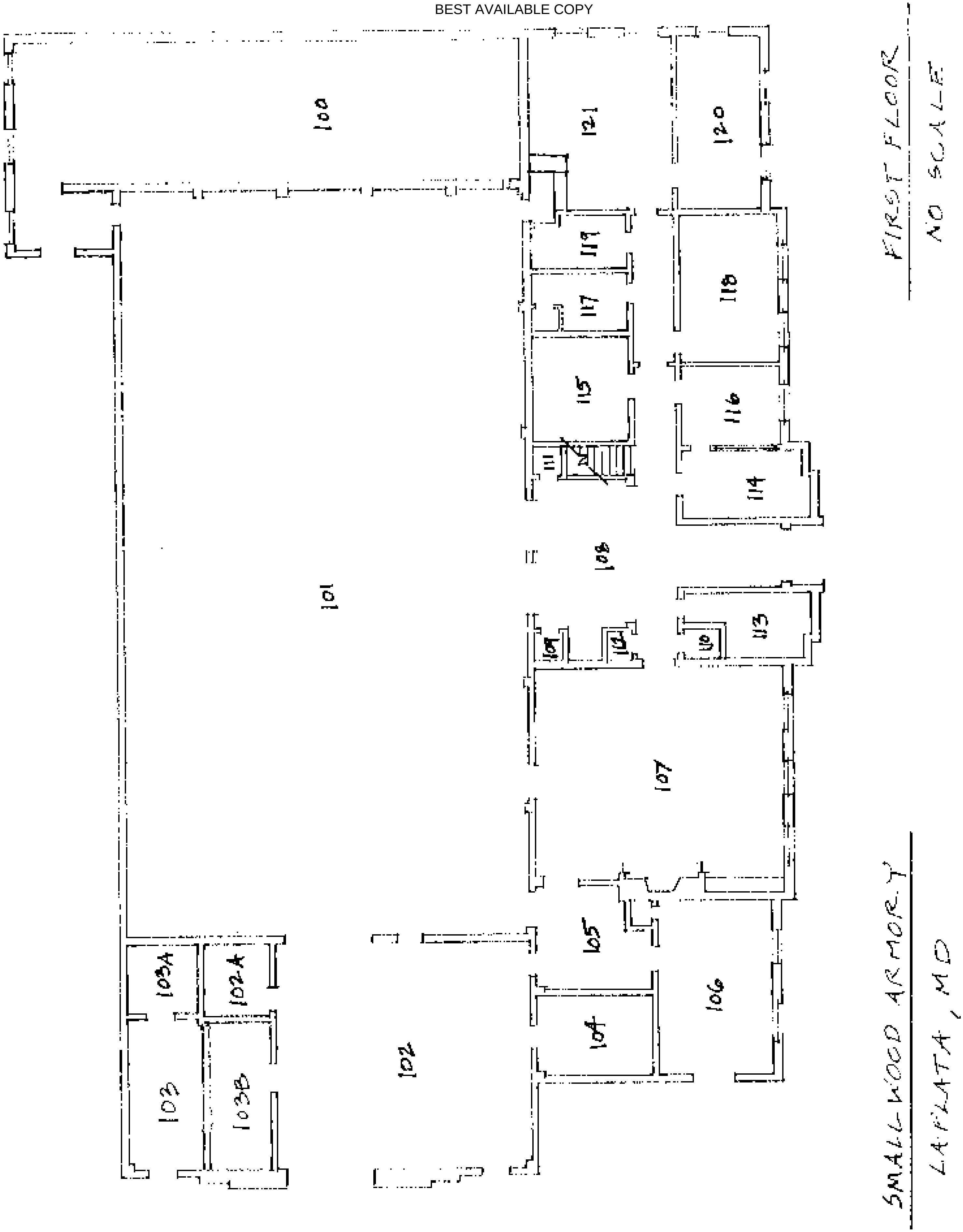
FIRST FLOOR
NO SCALE
SMALLWOOD ARMORY
LA PLATA, MD
100
101
102
102A
103
103A
103B
104
105
106
107
108
109
110
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112
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116
117
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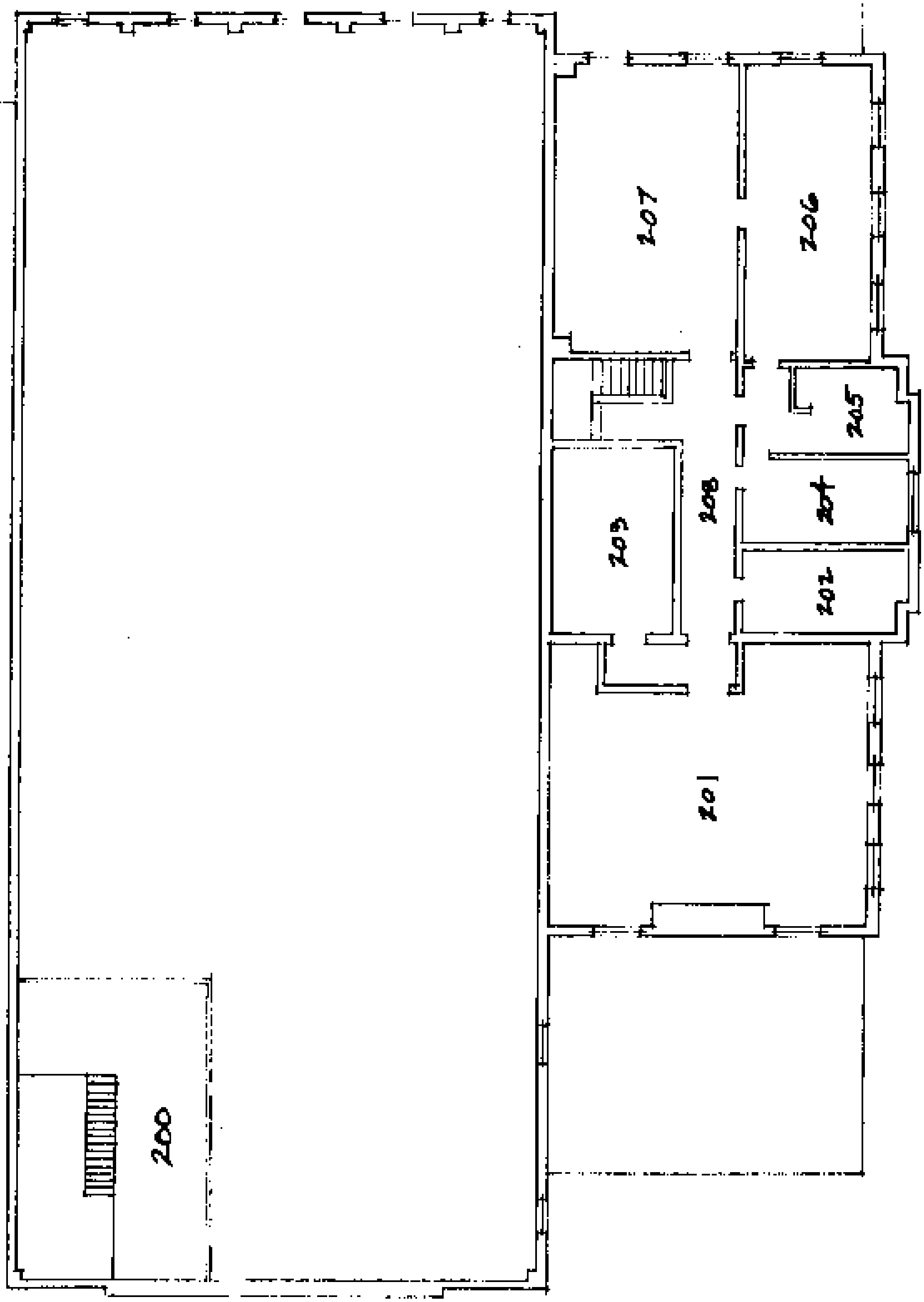
119
120
121

SECOND FLOOR

NO SCALE



SMALLWOOD ARMORY

LAPLATA, MD

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Appendix D. References

1. Title 29 Code of Federal Regulations (CFR). Part 1910.1025, Occupational Safety and Health Administration. Occupational Exposure to Lead

2. American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2010 Edition

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition

4. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007

5. RP-1-2004. Industrial Lighting, Illuminating Engineering Society of North America/ANSI

6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

7. National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

8. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h)(3)]

9. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

10. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation

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COMPLIANCE MANAGEMENT INTERNATIONAL

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
La Plata Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**La Plata Readiness Center** **14 W. Hawthorne Drive** **La Plata, MD 20646**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**October 3, 2013**
Report Date:	**November 20, 2013**

Non-Responsive [redacted]

Non-Responsive [redacted], **CIH**
Manager, Industrial Hygiene Services

Table of Contents

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on October 3, 2013, at the La Plata Readiness Center located at 14 W. Hawthorne Drive, La Plata, MD 20646. The survey was performed by Mr. Don Hartman.

1. Lead surface and air samples were below the recommended limits. 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 of the locations measured. See Section 4.0 for detailed findings.

3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.

   a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2013 recommended guideline of 68-79 °F in areas sampled.

   b. The relative humidity levels met the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in the areas tested.

   c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 parts per million (ppm).

   d. Carbon dioxide (CO_2) levels met the ASHRAE 62.1-2013 recommended guidelines for mechanically ventilated office buildings and commercial settings.

   See Section 5.0 for detailed sampling results.

4. It was reported that the building has several roof leaks. Water damaged ceiling and walls were observed in the Lobby and 1st Floor Supply Room.

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Section 2.0 Operation Description & Observations

The La Plata Readiness Center is mainly an administrative facility with a drill hall, offices, and classrooms. There were four (4) full-time employees stationed at the facility at the time of this survey. There is one (1) maintenance person assigned to the building.

The building is reported to have been built in 1954. It is a two story structure. The exterior is brick and concrete. The interior walls are block and concrete. The floors are concrete, 12”x12” floor tiles, 9” x 9” floor tiles, and ceramic tile.

The heating system is an oil-fired hot water unit. Air conditioning in the facility is supplied by window units.

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.

Suspect asbestos containing material (ACM) was observed at the time of this survey.

Housekeeping is adequate.

It was reported that the building has several roof leaks.

Water damaged ceiling and walls were observed in the Lobby and 1st Floor Supply Room.

Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 micrometer (um) mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2
1	Assembly Hall	<6	*
2	Office 253	<6.3	*
3	Blank	<3	*
4	Blank	*	<12
5	Assembly Hall – Floor	*	<110
6	Assembly Hall – Top of Locker	*	<110
7	Lobby – Display Monitor	*	<110
8	Converted Firing Range – Floor Outside Entrance	*	<110
9	Converted Firing Range – Floor Inside Entrance	*	<110
10	Converted Firing Range – Top of Locker	*	<110
11	Converted Firing Range – TV Gym End	*	<110
12	Converted Firing Range – Floor Bullet Trap End	*	<110
13	Office 253 – Window Sill	*	<110
14	Copy Office – Top of Cabinet	*	<110
15	Lounge – Top of Refrigerator	*	<110
16	Kitchen – Top of Freezer	*	<110
17	Maintenance Office – Top of A/C	*	<110
18	2nd Floor Gym – Window Sill	*	<110
19	2nd Floor Locker Room – Top of Locker	*	<110
20	2nd Floor Library – Top of Bookshelf	*	<110
-	**Criteria**	**50**	**200**

Table Notes:
1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2 =** micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Sources:

1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges
2. OSHA 29CFR1910.1025 Lead Standard

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 "Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on 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 met the recommended guideline of <200 ug/ft^2 in all locations sampled.

- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m^3).

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
2nd Floor Gym	37.1	30	Yes
Locker Room	52.1	7	Yes
2nd Floor Men's Latrine	33.9	5	Yes
2nd Floor Corridor	8.5	5	Yes
2nd Floor Locker Room	50.3	7	Yes
2nd Floor Library	42.8	30-50	Yes
Command/Staff Locker Room	59.1	7	Yes
Supply Room-Bulk	46.1	10	Yes
Copy Room	114.3	10	Yes
Office 253	42.7	30-50	Yes
Lobby	46.9	10	Yes
Main Corridor	35.5	5	Yes
Office CMDR A	59.1	30-50	Yes
Office CMDR B	59.8	30-50	Yes
Lounge	17.9	10	Yes
Kitchen-Food Prep	77.3	50	Yes
Office Armory	60.3	30-50	Yes
Supply Room-Bulk	27.1	10	Yes
Gym	44.3	30	Yes
Assembly Hall	35.2	10	Yes
Boiler Room	49.1	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 met the minimum recommended guideline in all areas measured.

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.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	75.5	65.8	372	0.3
2nd Floor Gym	75.2	57.7	560	0.2
Office 253	75.8	59.4	536	0.6
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. **°F =** degrees Fahrenheit

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2013, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements met the recommended 68-79°F in all occupied areas.

- Relative humidity levels met the recommended guideline of 30 – 60 % in all locations measured.

- 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 following observation were noted:

    1. Water-damaged ceiling was observed in the Lobby. Water damaged walls and window frame were observed in the 1st Floor Supply Room. 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.

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Section 6.0 Suspect Asbestos Containing Building Materials (ACM)

Suspect asbestos containing floor tile was noted at the time of this survey. The floor tile is found throughout the 2nd floor and in the Main Corridor and Supply Room of the 1st Floor. In the 1st Supply Room and the 2nd Floor Locker Room, tiles in several areas were loose or missing. The tiles were in good condition and intact, therefore not sampled.

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

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Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	39018	3/2013	NA
Cal Light 400 Light Meter	98011EL	11/2012	NA
SKC Air Sampling Pump	647631	10/03/13	2.79 LPM
SKC Air Sampling Pump	647610	10/03/13	2.64 LPM

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Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A. Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org
LAB #100470

Client:	National Guard Bureau	**Job Name:**	ARNG 4a MD	**Chain Of Custody:**	516880
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	La Plata	**Date Submitted:**	10/7/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	10/25/2013 **Report Date:** 10/28/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
14001536	1	Flame	Air	502	N/A	6	ug/m³	<3	<6	ug/m³	
14001537	2	Flame	Air	475	N/A	6.3	ug/m³	<3	<6.3	ug/m³	
14001538	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
14001539	4	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
14001540	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001541	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001542	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001543	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001544	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001545	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001546	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001547	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001548	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001549	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001550	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001551	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001552	17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001553	18	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001554	19	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #100470

Client:	National Guard Bureau	**Job Name:**	ARNG 4a MD	**Chain Of Custody:**	516880
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	La Plata	**Date Submitted:**	10/7/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	10/25/2013
				Report Date:	10/28/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Total ug	Final Result	Comments
14001555	20	Flame	Wipe	****	0.108	110 ug/ft²	<12	<110 ug/ft²	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)

%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: Nida McGarvey

Technical Manager: G Edward Carney

OM (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) 516880

10/3 1/2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: ARNG 4a MD
2. Job Location: LA PLATA
3. Job #: [redacted] P.O. #: W912K6-09-A-0003
4. Contact Person [redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted] Signature [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled): ☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:

NORMAL BUSINESS HOURS: ☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day + Date Due: 10/14/13 ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO: ☒ Inclu[redacted]ith Report ☒ Emai[redacted] compliance place.com ☐ Fax: [redacted]us.army.mil ☐ Verba[redacted]us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area)Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☐ Pb Dust Wipe (wipe type Ghost) 17 (QTY)
☐ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media____) ____ (QTY)
☐ Other (Specify____) ____ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

LOT 3/23/12 EXP 9/15

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1	ASSEMBLY HALL	10/3/13	502					✓		✓						
2	OFFICE 253		475							✓						
3	BLANK		—							✓						
4	BLANK											✓				
5	Assembly HALL FLOOR CTR			100cm²												
6	" LOCKER TOP															
7	LOBBY DISPLAY MONITOR TOP															
8	CFR FLOOR OUTSIDE ENT															
9	" " INSIDE "															
10	" Locker TOP															
11	" TV GYM END															
12	" FLOOR TRAP END (Gym)															

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: 10/7 Contact: DH By: MRM
Need volumes for lead air samples.
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 10/7/13 @ 830 Via: FedEx By (Print): MRM Sign:
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ___ Sign: ___
3. Results Reported To: ___ Via: ___ Date: ___/___/___ Time: ___ Initials: ___
4. Comments: 7903 2770 5593

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516880
2 of 2
10/3

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CHAIN OF CUSTODY

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4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: ARNG 4aMD
2. Job Location: LA PLATA
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person [redacted] [redacted]
5. Submitted by: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day +
☐ 2 Day Date Due:
☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

REPORT TO:
☒ Include [redacted] with Report
☒ Email [redacted] compliaceplace.com
☐ Fax: [redacted] @us.army.mil
☐ Verbal [redacted] @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area)Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☐ Pb Dust Wipe (wipe type Contest) 17 (QTY)
☐ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

LOT 8/23/12
Exp 9/15

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	WIPE/DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13 OFFICE 253	Window Sill	10/3/13		100cm²				✓				✓				
14 COPY OFFICE	CABINET TOP															
15 Lounge	FRIG TOP															
16 KITCHEN	FREEZER TOP															
17 MAINTENANCE	office A/C TOP															
18 2ND FLR GYM	WINDOW SILL															
19	Locker Room Locker TOP															
20	LIBRARY Bookshelf TOP															

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

Sign:

LABORATORY (CHAIN OF CUSTODY)
1. Date/Time RCVD: / / @ Via: By (Print): Sign:
2. Date/Time Analyzed: / / @ By (Print): Time: Initials:
3. Results Reported To: Date: / /
4. Comments:

Appendix B. Photographs

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La Plata RC

Converted Firing Range

Damaged Suspect ACM Floor Tile

Lobby Water Damaged Ceiling

Supply Room Water Damaged Window

Supply Room Water Damaged Wall

Boiler Room

Locker Room Damaged Floor Tile

Appendix C. Floor Plan

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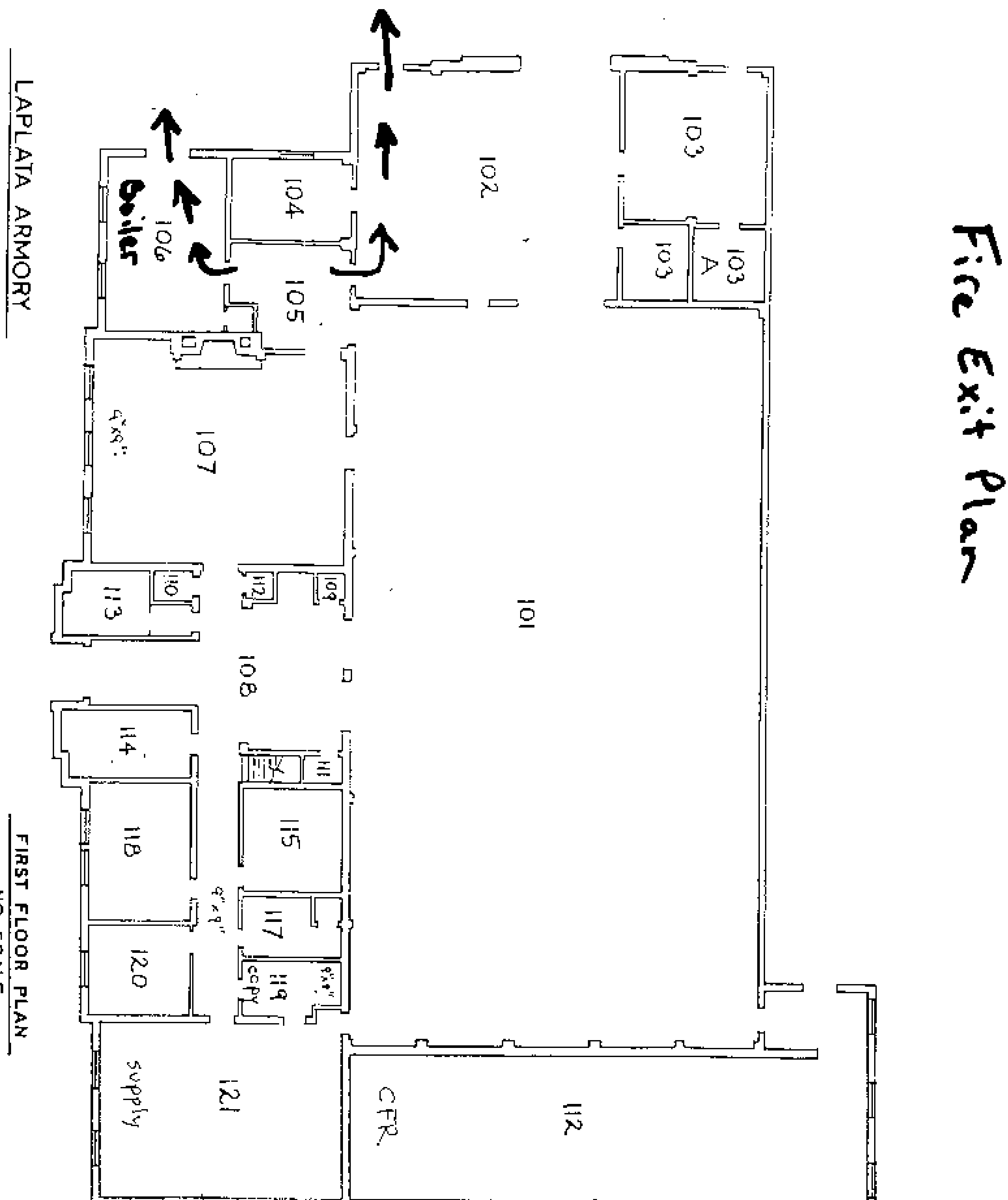
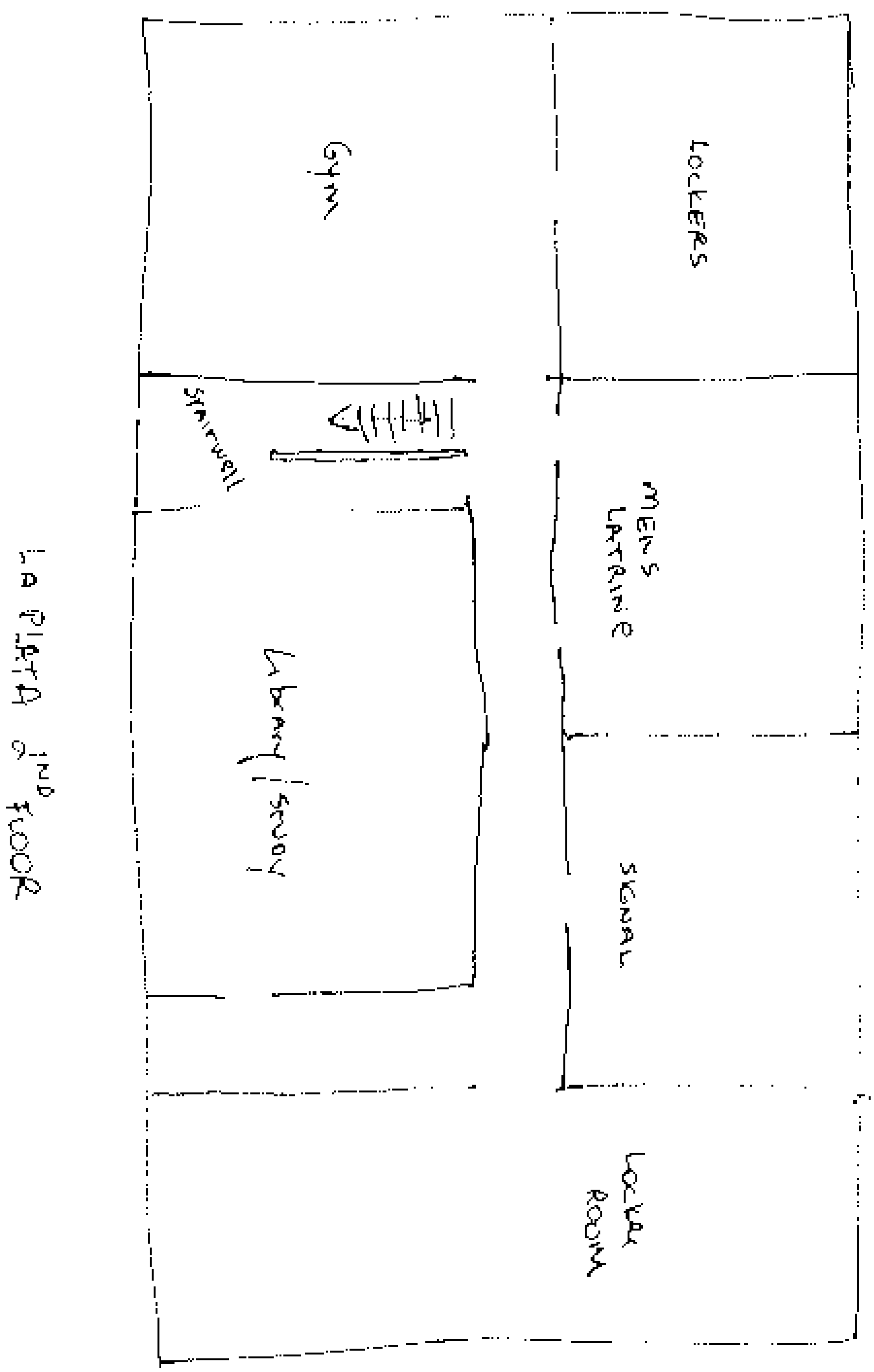

Fire Exit Plan
LAPLATA ARMORY
FIRST FLOOR PLAN
NO SCALE
101
102
103
103
103 A
104
105
106
Boiler
107
108
109
110
112
113
114
115
117
118
119
COPY
120
121
supply
CFR
112



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Appendix D. References

1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead.

2. American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2013 Edition.

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 28th Edition.

4. American National Standard 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

31 AUGUST 2005

MEMORANDUM FOR Region North Industrial Hygiene Office (NGB-AVS-SI-IH/ Ms. [redacted]) Army National Guard Bureau, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Pikesville Military Reservation, MD, Project No. 55-ML-01ED-03/05

1. Enclosed is the final copy of the subject report and two CD-ROMs.

2. The project number for this service reflects the current fiscal year of dispatch and the actual field work which was completed for fiscal year 2003. The State of Maryland Army National Guard occupational health nurse was immediately notified in writing of findings necessitating immediate corrective action in Maryland armories. In addition the National Guard Bureau Region North Industrial Hygiene Office has been notified of all the results of lead in dust sampling conducted in all facilities. Draft reports were reviewed by you or other members of the National Guard and members of this Center, including our editorial staff, during drafting stages in report preparation leading up to the final report.

3. Our point of contact is Ms. [redacted], at commercial (410) 436-5475/3118, DSN 584-5475/3118, or electronic mail [redacted]@us.army.mil

FOR THE COMMANDER:

[redacted]

Encl

Director, Occupational Health Sciences

CF:
USACHPPM-NORTH, (MCHB-AN-IH/MR. [redacted])

Readiness thru Health

U.S. Army Center for Health Promotion and Preventive Medicine

USACHPPM

CONSERVARE SALUTEM

MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEYS
PIKESVILLE MILITARY RESERVATION
BALTIMORE, MD
PROJECT NO. 55-ML-01ED-03/05
22 AND 23 JULY 2003

Approved for public release; distribution unlimited

CHPPM FORM 432-E (MCHB-CS-IPD), OCT 03

Readiness Thru Health

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U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed $3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- *Integrity is the foundation*
- *Excellence is the standard*
- *Customer satisfaction is the focus*
- *Its people are the most valued resource*
- *Continuous quality improvement is its pathway*

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

CHPPM FORM 432-E (MCHB-CS-IPD), OCT 03 *(reverse)*

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEYS
PIKESVILLE MILITARY RESERVATION
BALTIMORE, MD
PROJECT NO. 55-ML-01ED-03/05
22 AND 23 JULY 2003

1. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard (MDARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions. This survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee for the Defense Occupational and Environmental Health Readiness System.

2. CONCLUSIONS.

a. <u>Lead in Air</u>. All air samples in the Armory and the John S. Edwards Administration Building were below the Occupational Safety and Health Administration (OSHA) standard of 50 $\mu g/m^3$ for lead in air. There were no overexposures to personnel from lead in air in these buildings.

b. <u>Lead in Paint</u>. Deteriorated lead-based paint and lead-contaminated paint were identified in the Edwards Administration Building and in the Armory during the survey. Both buildings were repainted with non-lead-based paint in 2005.

c. <u>Lead in Dust</u>. Levels of lead in dust that exceeded safe limits for children and adults were identified in Edwards Administration Building and in the Armory during the survey. The buildings have been cleaned; however, there may still be lead in dust in the buildings.

d. <u>Safety Hazards.</u> Many safety hazards were observed in the Edwards Administration Building only during the survey. Upon completion of the survey, we immediately notified the MD NGB-Region North Office and LTC [redacted], the MD State Occupational Health Nurse, of the safety violations. The Edwards Administration Building roof was damaged, causing the roof and ceiling to leak and portions of the ceiling to collapse. The Pikesville Military Reservation point of contact stated that all safety hazards have been corrected. The Merson Building roof was replaced in 2004. The Edwards Building roof was replaced in 2005. New drop ceilings were installed in both buildings.

e. Mold and Moisture Problems. Excessive moisture in the Edwards Administration Building due to the leaking roof had caused mold growth and standing water on the floors. Mold was also observed in the Armory. Mold exposure may cause illness in some employees. All mold has been removed from both buildings.

f. Safety and Occupational Health Programs. There was no written Lead Hazard Management Plan (LHMP) for Pikesville Military Reservation. There was no written Hazard Communication (HAZCOM) Program for the Armory. These deficiencies may result in employee overexposure to hazardous materials. The OSHA requires employers to provide information to their employees concerning hazardous chemicals to which they are exposed. This is accomplished by establishing a HAZCOM Program for Armory employees. Program elements include the use of labels and other forms of warning, MSDSs, and information and training addressing protective measures for employees.

3. RECOMMENDATIONS.

a. Lead Exposure. Health Hazard Risk Assessment Code (RAC) 3.

(1) Develop and implement a LHMP for the Armory and the Edwards Administration Building.

(2) Adult Lead Exposure. Clean all administrative area horizontal surfaces that have elevated lead levels to the NGB Region North and USACHPPM recommended safe limit for floors and frequently contacted surfaces. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after clean up. Cleaning dust containing lead may further prevent lead from becoming redistributed into adjacent rooms and resulting in exposures for children and for the general workforce. Ensure that personnel wear disposable gloves and disposable coveralls as extra protection when working in all areas identified as having elevated levels of lead.

(3) Child Lead Exposure. Address all potential lead hazards in the Armory before continuing to extend use of this facility to children. Clean the floor in the Armory Drill Hall to the EPA lead in dust standards for young children, and clean other horizontal surfaces in the Drill Hall to the NGB Region North and USACHPPM decontamination level for lead in dust on frequently contacted surfaces.

b. Safety Hazards. Safety Hazard RAC 5. Continue to monitor the condition of all Pikesville Military Reservation facilities.

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c. Mold and Moisture Problems. Health Hazard RAC 5. If mold growth occurs in the future, refer to the guidance on moisture control and mold remediation in USACHPPM TG 278, Industrial Hygiene/Preventive Medicine Mold Assessment Guides, and USACHPPM TG 277, Army Facilities Management Information Document on Mold Remediation Issues.

d. Safety and Occupational Health Programs. Health Hazard RAC 3. Establish a written HAZCOM Program for the Armory. Maintain records for HAZCOM training and store them in an accessible area.

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MDARNG Facilities IH Baseline Surveys, Pikesville Military Reservation, Baltimore MD, Project No. 55-ML-01ED-03/05

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Appendices

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEYS
PIKESVILLE MILITARY RESERVATION
BALTIMORE, MD
PROJECT NO. 55-ML-01ED-03/05
22 AND 23 JULY 2003

1. 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. Fax, National Guard Bureau (NGB) Region North Industrial Hygiene Office (NGB-AVS-SI-IH/Ms. Vanessa Franchere), 28 February 2003, subject: SAB.

4. BACKGROUND INFORMATION.

a. Armory Mission and Units. The Pikesville Military Reservation mission is training and mobilization. We surveyed the John S. Edwards Administration Building, the home of the Headquarters (HQ) 3rd Brigade; the MAJ General John Purley Cooper, Jr. Armory; the NCO Club, and the Col. Bernard D. Merson Building. In addition to the HQ 3rd Brigade, the units located in these facilities are the 32nd Weapons of Mass Destruction team, the 29th Joint Task Force, the B Company 129th Signal company, the C/2 110th FA Control, the HHS/2-110th FA Control, the Distance Education Center, and the State of Maryland Maintenance Team.

b. Date of Construction. The Pikesville Military Reservation buildings were constructed in 1903.

c. Armory Use by Children. SFC [redacted], a Pikesville Military Reservation point of contact (POC), stated that the use of the Armory for children is occasional. The Armory sponsors community events and shows for the public monthly, and children are present in the Armory during these times. The Maryland Military Department is currently advertising Pikesville Armory as available for rental for activities that include young children.

Readiness thru Health

MDARNG Facilities IH Baseline Surveys, Pikesville Military Reservation, Baltimore MD, Project No. 55-ML-01ED-03/05

d. Points of Contact. SGM [redacted], Manager 410-653-6755 and SFC [redacted] 410-653-6715, Pikesville Military Reservation, 610 Reisterstown Road, Baltimore, MD 21208-5197.

5. FACILITY EVALUATION.

a. Safety Hazards.

(1) Many safety hazards were observed in the Edwards Administration Building during the survey. Upon completion of the survey, we immediately notified the MD NGB-Region North Office and LTC [redacted], the MD State Occupational Health Nurse, in writing of several safety violations in the Edwards Administration Building.

(2) The Edwards Administration Building roof was damaged, causing the roof and ceiling to leak, portions of the ceiling to collapse, and standing water on the floor. In Room 21, and in some areas of the second floor, roof leaks caused light fixtures to fall onto the floor (See Appendix B Photographs 1338 & 1339). The roof was caving in on the second floor and occupants had abandoned some areas. There were also ceiling leaks in Room 09 (Photographs1346 & 1347). Personnel vacated offices due to the collapsing ceiling (Photographs 1334 & 1335). The leaking roof caused the ceiling to collapse in Room 19 (Photograph 1337).

b. Sampling Locations and Results. Samples were collected for lead in air, on surfaces (wipe samples), and in paint to determine the presence of lead hazards. Lead sample results and locations are shown in Appendix C.

c. Paint. The age of the buildings indicated that the presence of paint containing lead was likely. Deteriorated paint was observed throughout the buildings.

d. Asbestos. Staff Sergeant (SSG) [redacted], Environmental Compliance Assessment Coordinator for the Maryland NGB, stated that all asbestos had been abated in the buildings.

e. Mold and Moisture Problems. Mold was observed on the walls and doors in the Edwards Administration Building. The Administration 1 area in the basement (Photographs 1340-1343) had been restricted from office use due to mold growth and deterioration of the walls. Water damage to walls and condensation from pipes was observed and reported by the occupants. Mold was also observed in the Armory.

f. Indoor Firing Range. SSG [redacted], stated that all lead in the converted indoor firing range (IFR) had been abated during its conversion.

g. Safety and Occupational Health Programs. There were no safety and occupational health program records in the facilities. Pikesville Military Reservation should have a written Lead Hazard Management Plan (LHMP) and a Hazard Communication (HAZCOM) Program.

h. Heating, Ventilation, and Air-Conditioning Systems. Ventilation and air were provided by window-mounted air conditioning units and the manual operation of windows. Heat was provided by oil and steam heat. The NCO room heat was provided by steam. No ventilation problems were observed or reported.

i. Noise Dosimetry. No operations with the potential to generate hazardous noise levels were identified.

6. ASSESSMENT CRITERIA FOR LEAD. See Appendix D for details.

a. Lead in Air. The Army complies with the Occupational Safety and Health Administration (OSHA) 8-hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter ($\mu g/m^3$) of air.

b. Lead in Dust. The Environmental Protection Agency (EPA) and State of Maryland limits for lead in dust are 40 micrograms per square foot ($\mu g/ft^2$) on floors, 250 $\mu g/ft^2$ on window sills, and 400 $\mu g/ft^2$ in window troughs. These limits apply to pre-1978 Army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The NGB Region North concurs with the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended safe limit of 200 $\mu g/ft^2$ on floors and frequently contacted surfaces, which is more stringent for window sills than the EPA/State standards.

c. Lead in Paint. Paint containing lead levels of 0.5 percent or more by weight in dried solid (also reported as 5000 milligrams per kilogram) is considered to be lead-based paint according to both Federal and Maryland State Regulations. Paint containing lead levels of more than 0.7 milligrams per square centimeter is considered to be lead-based paint according to Maryland State Regulations. In Army Regulation (AR) 420-70, Buildings and Structures, lead-contaminated paint is defined as any paint containing detectable amounts of lead. The Army considers lead-contaminated paint to be potentially hazardous to children if it is disturbed or deteriorating.

d. Lead Carcinogenicity. The Department of Health and Human Services National Toxicology Program (NTP) released the Report on Carcinogens, Eleventh Edition in February 2005. The NTP report lists “lead and lead compounds” as “reasonably anticipated to be human carcinogens”.

7. SAMPLING RESULTS, DISCUSSION, AND CONCLUSIONS.

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a. Lead in Air. All air samples in the Armory and the in the Edwards Administration Building were below the Occupational Safety and Health Administration (OSHA) standard of 50 µg/m³ for lead in air. There were no overexposures to personnel from lead in air in these buildings.

b. Lead in Paint. At the time of the survey there was deteriorated lead-based paint (LBP) in the Edwards Administration building and and lead-contaminated paint (LCP) in the Armory. The POC stated that both buildings were repainted with non-lead-based paint in 2005.

c. Lead in Dust. Lead in dust wipe sampling locations and results are in the Table below. Levels of lead in dust that exceeded safe limits for children and adults were identified during the survey. The POC stated that dust has been cleaned in the buildings. However, there may still be lead in dust in the buildings.

(1) Adult Lead Exposure. In the Edwards Administration Building, deteriorated LCP was collected from the window sill in room 8 (photo #1331). Surface wipe samples exceeding the USACHPPM and the NGB Region North decontamination guidance were collected in the windowsill in the room 14 break room (photo #1328) and the window sill in room 8 (photo #1331).

In the Armory, three of the surface wipe samples exceeding the USACHPPM and the NGB Region North decontamination guidance were collected in the area of the converted IFR. One was collected from the floor of the old IFR bullet trap (photo #1323); one on the bench of the old IFR near what used to be the plenum (photo #1324); and one on the floor under the radiator in the old IFR (photo #1326). This sample contained the highest level of lead (> 13,000 µg/ft²). Additional samples exceeding the guidelines were collected from the window sill of the Physical Training area on the third floor (photo #1368), the floor of the vault area of room 8 on the second floor (photo #1365), and the floor of the vault area near the main door (photo #1367).

(2) Child Lead Exposure. Ten lead in dust wipe samples in the Armory exceeded Federal and State of Maryland lead exposure levels for children. There is a potential hazard for children using this facility. Some of the results are several hundred times the Federal standard for lead in dust, with a maximum result of 13,000 µg/ft².

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MDARNG Facilities IH Baseline Surveys, Pikesville Military Reservation, Baltimore MD, Project No. 55-ML-01ED-03/05

TABLE. Lead in Dust Wipe Locations and Analytical Results.

Wipe Sample #	Location of Samples	Conc. (µg/ft²)
PIW01	ARMORY DRILL FLOOR NEAR CENTER EXIT	<23
PIW02	ARMORY BLEACHER NEAR CLASSROOM #4	<23
PIW03	ARMORY DOOR TO KITCHEN & SMOKING AREA FROM ARMORY	26
PIW04	ARMORY TOP OF ICE MAKER CANTEEN AREA	BDL
PIW05	ARMORY FORMER IFR BULLET TRAP FLOOR	6436
PIW06	ARMORY FORMER IFR BENCH NEAR FORMER SUPPLY PLENUM	747
PIW07	ARMORY FLOOR OUTSIDE FORMER IFR DOOR	39
PIW08	ARMORY FORMER IFR UNDER RADIATOR	13818
PIW09	ARMORY WINDOW SILL NEAR ROOM 210	136
PIW10	ARMORY WINDOW SILL IN BREAKROOM	455
PIW11	ARMORY ROOM 8 (CONFERENCE AREA) TOP OF BOOKCASE	<23
PIW12	ARMORY STEP IN ROOM 8 LEADING TO CHIEF OPS SGT	<23
PIW13	ARMORY RECRUITMENT OFFICE ROOM 11 TOP OF BOOKCASE	<23
PIW14	ARMORY ROOM 11 TOP OF SWITCH STATION	<23
PIW15	ROOM 21 FLOOR UNDER FALLEN LIGHT FIXTURE	<23
PIW16	ARMORY FLOOR IN VAULT AREA (ROOM # 8) SECOND FLOOR	207
PIW17	ARMORY FLOOR VAULT AREA OUTSIDE # 11	129
PIW18	ARMORY FLOOR VAULT AREA NEAR MAIN DOOR	511
PIW19	ARMORY WINDOW SILL OF PT AREA THIRD FLOOR	238
PIW20	ARMORY CAGE FLOOR # 307 AREA THIRD FLOOR	92
PIW21	NCO CLUB FIREPLACE MANTLE	<23
PIW22	KITCHEN COUNTER NCO CLUB	<23
PIW23	MERSON BLDG WINDOW SILL SECOND FLOOR PERSONNEL OFFICE/	<23
PIW24	MERSON BLDG CLASSROOM FLOOR CORNER	<23
PIW25	MERSON BLDG BEHIND DOOR TO EXIT IN CORNER OF FLOOR	<23

d. Safety Hazards. The POC stated that all safety hazards have been corrected. The Merson Building roof was replaced in 2004. The Edwards Administration Building roof was replaced in 2005. New drop ceilings were installed in both buildings.

e. Mold and Moisture Problems. Excessive moisture in the Edwards Administration

Building due to the leaking roof had caused mold growth and standing water on the floors. Mold was also observed in the Armory. Mold exposure may cause illness in some employees. All mold has been removed from both buildings.

f. Safety and Occupational Health Programs. There was no written HAZOM Program for the Armory. This deficiency may result in employee overexposure to hazardous materials in the Armory. The OSHA requires employers to provide information to their employees concerning hazardous chemicals to which they are exposed. This is accomplished by establishing a HAZCOM Program for Armory employees. Program elements include the use of labels and other forms of warning, MSDSs, and information and training addressing protective measures for employees.

8. RECOMMENDATIONS. The Department of Defense Instruction 6055.1 provides Risk Assessment Codes (RACs) for health hazards, a procedure which allows assessment of the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and combines the hazard severity and accident probability into a single number. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

a. Lead Exposure. Health Hazard RAC 3.

(1) Develop and implement a LHMP.

(2) Adult Lead Exposure. Clean all administrative area horizontal surfaces that have elevated lead levels to the NGB Region North and USACHPPM recommended safe limit for floors and frequently contacted surfaces. Comprehensive guidelines for cleaning are in Appendix E. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after clean up. Cleaning dust containing lead may further prevent lead from becoming redistributed into adjacent rooms and resulting in exposures for children and for the general workforce. Ensure that personnel wear disposable gloves and disposable coveralls as extra protection when working in all areas identified as having elevated levels of lead.

(3) Child Lead Exposure. Address all potential lead hazards in the Armory before continuing to extend use of this facility to children. Clean the floor in the Armory Drill Hall to the EPA lead in dust standards for young children, and clean other horizontal surfaces in the Drill Hall to the NGB Region North and USACHPPM decontamination level for lead in dust on frequently contacted surfaces.

b. Safety Hazards. Safety Hazard RAC 5. Continue to monitor the condition of all the facilities.

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MDARNG Facilities IH Baseline Surveys, Pikesville Military Reservation, Baltimore MD, Project No. 55-ML-01ED-03/05

10. ADDITIONAL ASSISTANCE. For additional assistance, or questions concerning this report, please contact the undersigned at DSN 584-3118, commercial 410-436-3118, or by Electronic mail to:[redacted]@us.army.mil

[redacted]
Industrial Hygienist
USACHPPM Lead and Asbestos Team Leader
Industrial Hygiene Field Services Program

APPROVED:

[redacted]
Technical Program Manager
Industrial Hygiene Field Services Program

APPENDIX A

REFERENCES

BEST AVAILABLE COPY

APPENDIX A

REFERENCES

1. Title 29, Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration, current edition.
http://www.osha.gov/comp-links.html

2. Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program, August 19, 1998.
http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf

3. AR 40-5, Medical Service, Preventive Medicine, 15 October 1990.
http://www.usapa.army.mil/pdffiles/r40_5.pdf

4. AR 385-10, The Army Safety Program, 29 February 2000.
http://www.usapa.army.mil/pdffiles/r385_10.pdf

5. DA PAM 40-503, Medical Services, Industrial Hygiene Program, 30 October 2000.
http://www.usapa.army.mil/pdffiles/p40_503.pdf

6. American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs), ACGIH Cincinnati, OH, 2005.
http://www.acgih.org/TLV/

7. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 62-2002, Ventilation for Acceptable Indoor Air Quality.

8. Illuminating Engineering (February 1, 1993) RP-1-1993, American National Standard Practice for Office Lighting, ANSI/IES RP-1-1993.

9. USACHPPM Interim Report No. 39-EJ-1157-99, Derivation of Wipe Surface Screening Levels for Environmental Chemicals, 1999.

10. OSHA Instruction, CPL 02-02-058 - CPL 2-2.58 - 29 CFR 1926.62, Lead Exposure In Construction; Interim Final Rule-- Inspection and Compliance, Procedures, 1993.
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=1570

11. U.S. Department of Housing and Urban Development (HUD), Technical Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing 1998.
http://www.hud.gov/offices/lead/guidelines/hudguidelines/index.cfm

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APPENDIX B

PHOTOGRAPHS

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Pikesville Photographs Showing Location of Lead Paint and Dust Wipe Samples

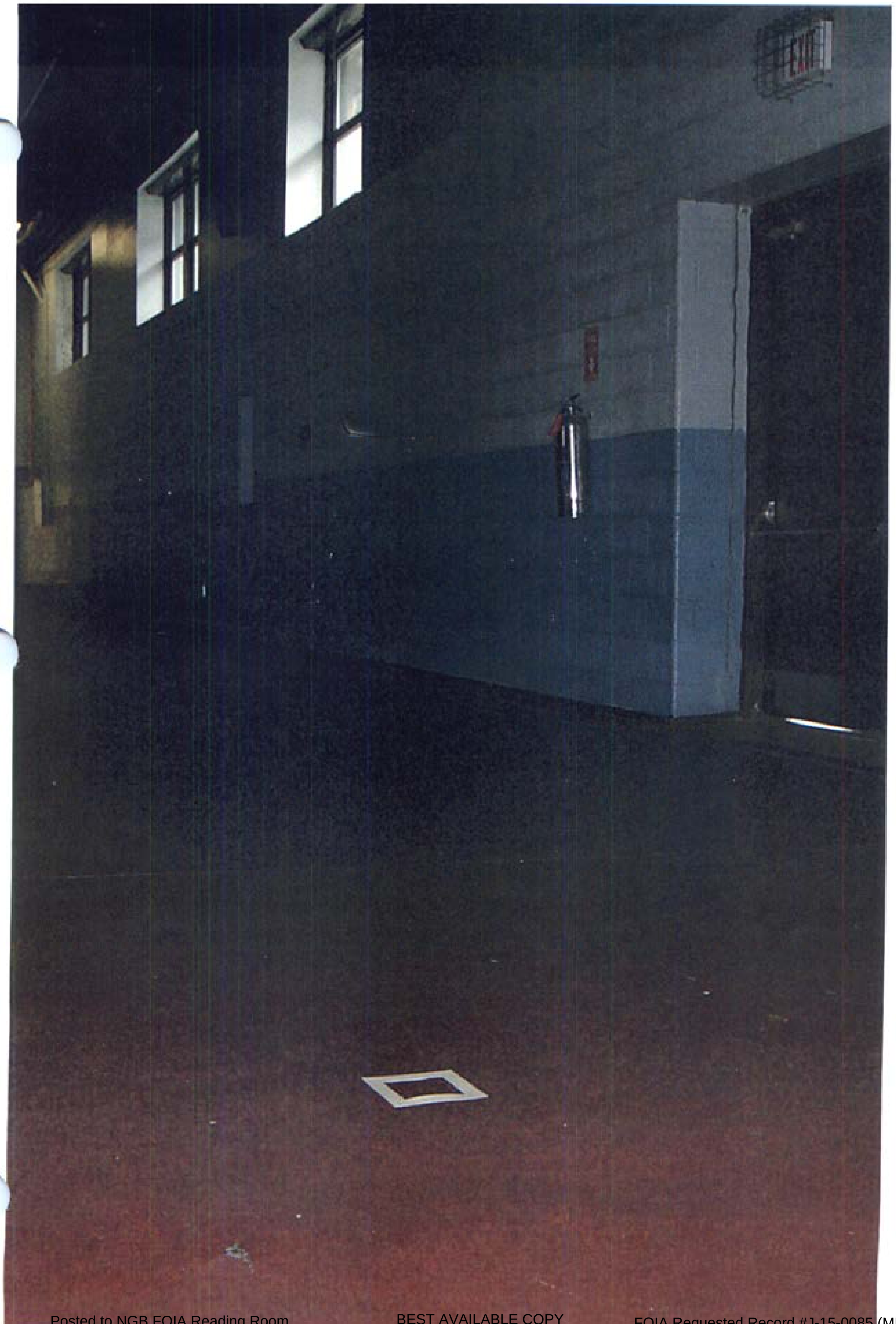
Photo #	Location of Samples
1317	ARMORY MAIN DRILL FLOOR NEAR CENTER EXIT
1318	ARMORY BLEACHER NEAR CLASSROOM #4
1319	ARMORY DOOR TO KITCHEN & SMOKING AREA FROM ARMORY
1320	ARMORY TOP OF ICE MAKER IN CANTEEN AREA
1323	ARMORY FORMER IFR BULLET TRAP FLOOR
1324	ARMORY FORMER IFR BENCH NEAR SUPPLY PLENUM
1325	ARMORY FLOOR ONE FOOT OUTSIDE DOOR TO FORMER IFR
1326	ARMORY FORMER IFR UNDER RADIATOR
1327	ARMORY WINDOW SILL NEAR ROOM 210
1328	ADMINISTRATION WINDOW SILL IN BREAKROOM (ROOM 14)
1329	ADMINISTRATION ROOM 8 (CONFERENCE AREA) TOP OF BOOKCASE
1330	ADMINISTRATION STEP IN ROOM 8 LEADING TO CHIEF OPS SGT
1331	ADMINISTRATION DETERIORATED LEAD-BASED PAINT WINDOW SILL ROOM 8
1332	ADMINISTRATION RECRUITMENT OFFICE ROOM 11 TOP OF BOOKCASE
1333	ADMINISTRATION RECRUITMENT OFFICE
1334	ADMINISTRATION ROOM 11 TOP OF SWITCH STATION
1335	ADMINISTRATION ROOM 21 ON FLOOR UNDER FALLEN LIGHT FIXTURE
1336	ADMINISTRATION ROOF LEAK DUE TO FALLEN LIGHT FIXTURE
1337	ADMINISTRATION ROOF LEAK DUE TO FALLEN LIGHT FIXTURE
1338	ADMINISTRATION FLOOR IN VAULT AREA (ROOM # 8) SECOND FLOOR
1339	ADMINISTRATION COLLAPSING CEILING DUE TO ROOF LEAK
1340	ADMINISTRATION HQ3RD BDE ADMIN AREA 1 OFF LIMITS DUE TO MOLD GROWTH
1341	ADMINISTRATION HQ3RD BDE ADMIN AREA 1 OFF LIMITS DUE TO MOLD GROWTH
1342	ADMINISTRATION HQ3RD BDE ADMIN AREA 1 OFF LIMITS DUE TO MOLD GROWTH
1343	ADMINISTRATION HQ3RD BDE ADMIN AREA 1 OFF LIMITS DUE TO MOLD GROWTH
1344	ADMINISTRATION CEILING LEAKS IN ROOM 09
1345	ADMINISTRATION CEILING LEAKS IN ROOM 09
1346	ADMINISTRATION CEILING LEAKS IN ROOM 09
1347	ADMINISTRATION CEILING LEAKS IN ROOM 09
1348	ADMINISTRATION CEILING LEAKS IN ROOM 09
1349	ADMINISTRATION CEILING LEAKS IN ROOM 09
1365	ARMORY FLOOR VAULT AREA OUTSIDE # 11
1366	ARMORY FLOOR VAULT AREA NEAR MAIN DOOR
1368	ARMORY WINDOW SILL OF PT AREA ON THIRD FLOOR

BEST AVAILABLE COPY

Pikesville Photographs Showing Location of Lead Paint and Dust Wipe Samples

Photo #	Location of Samples
1369	ARMORY WINDOW SILL OF PT AREA ON THIRD FLOOR
1370	ARMORY FLOOR OF CAGE # 307 AREA THIRD FLOOR
1371	NCO CLUB FIREPLACE MANTLE
1372	NCO CLUB BULK SAMPLE DETERIORATED PAINT
1373	NCO CLUB KITCHEN COUNTER
1374	MERSON BUILDING WINDOW SILL SECOND FLOOR PERSONNEL OFFICE
1375	MERSON BUILDING CLASSROOM
1376	MERSON BUILDING CLASSROOM FLOOR CORNER
1377	MERSON BUILDING BEHIND DOOR TO EXIT IN CORNER OF FLOOR

BEST AVAILABLE COPY



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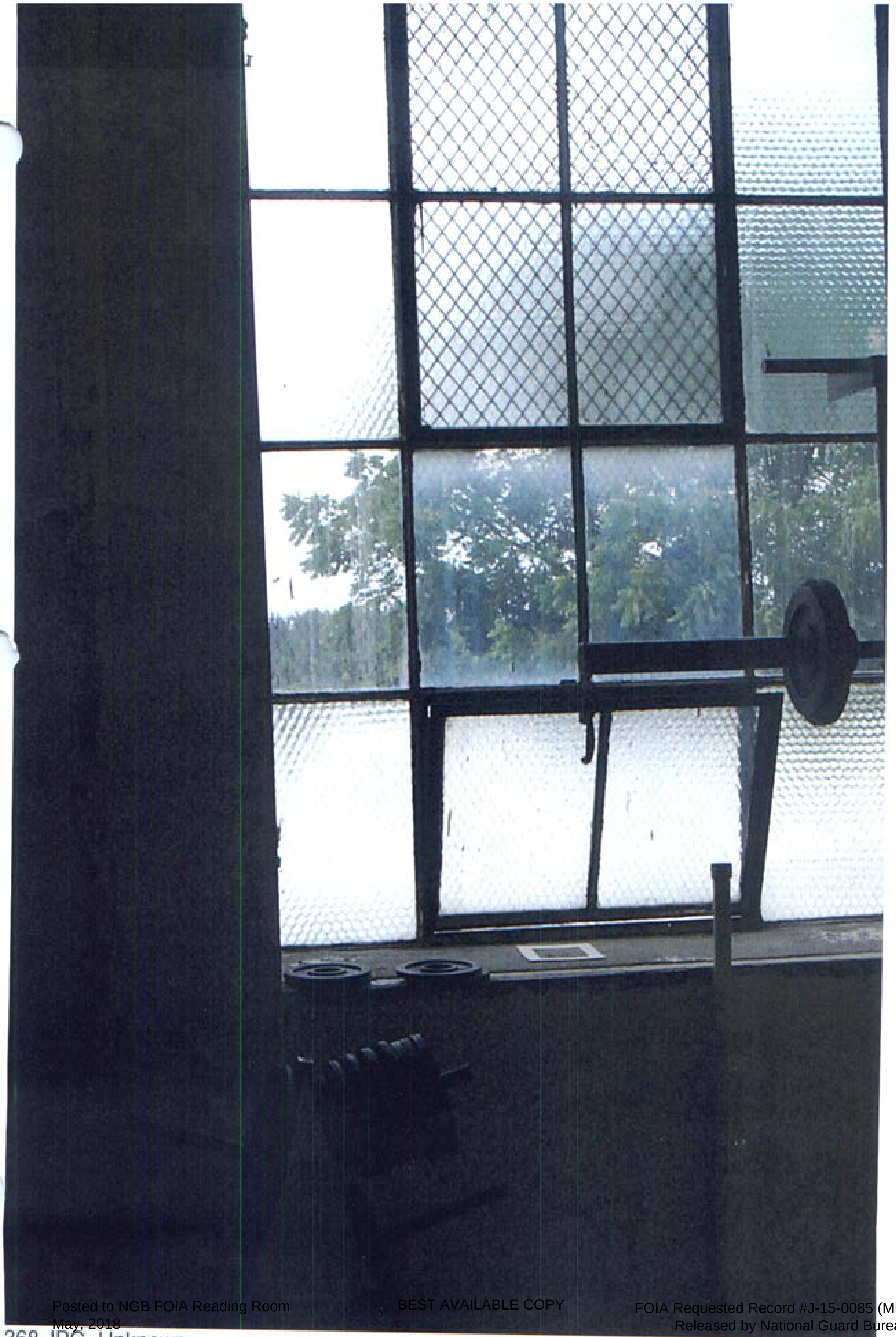

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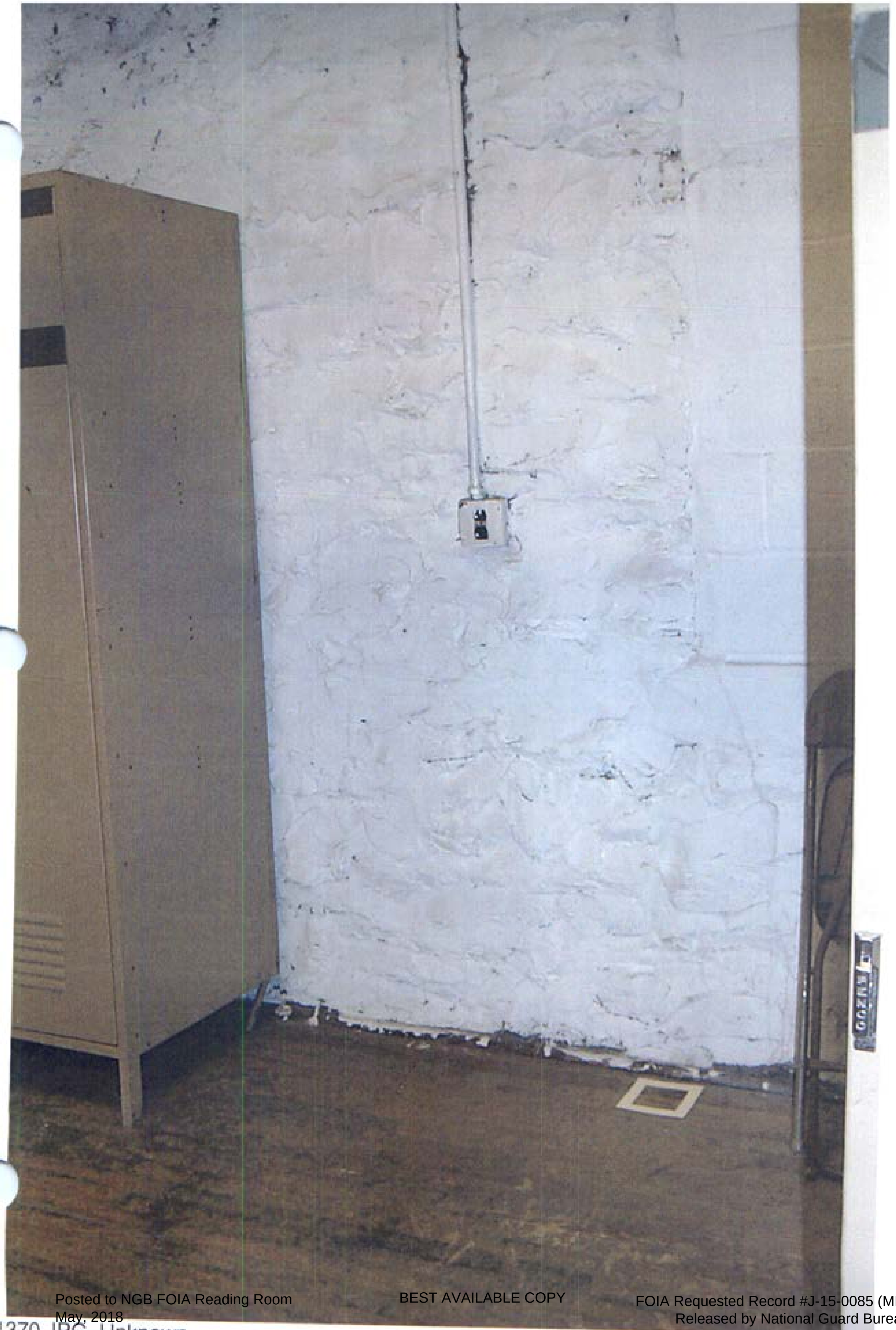

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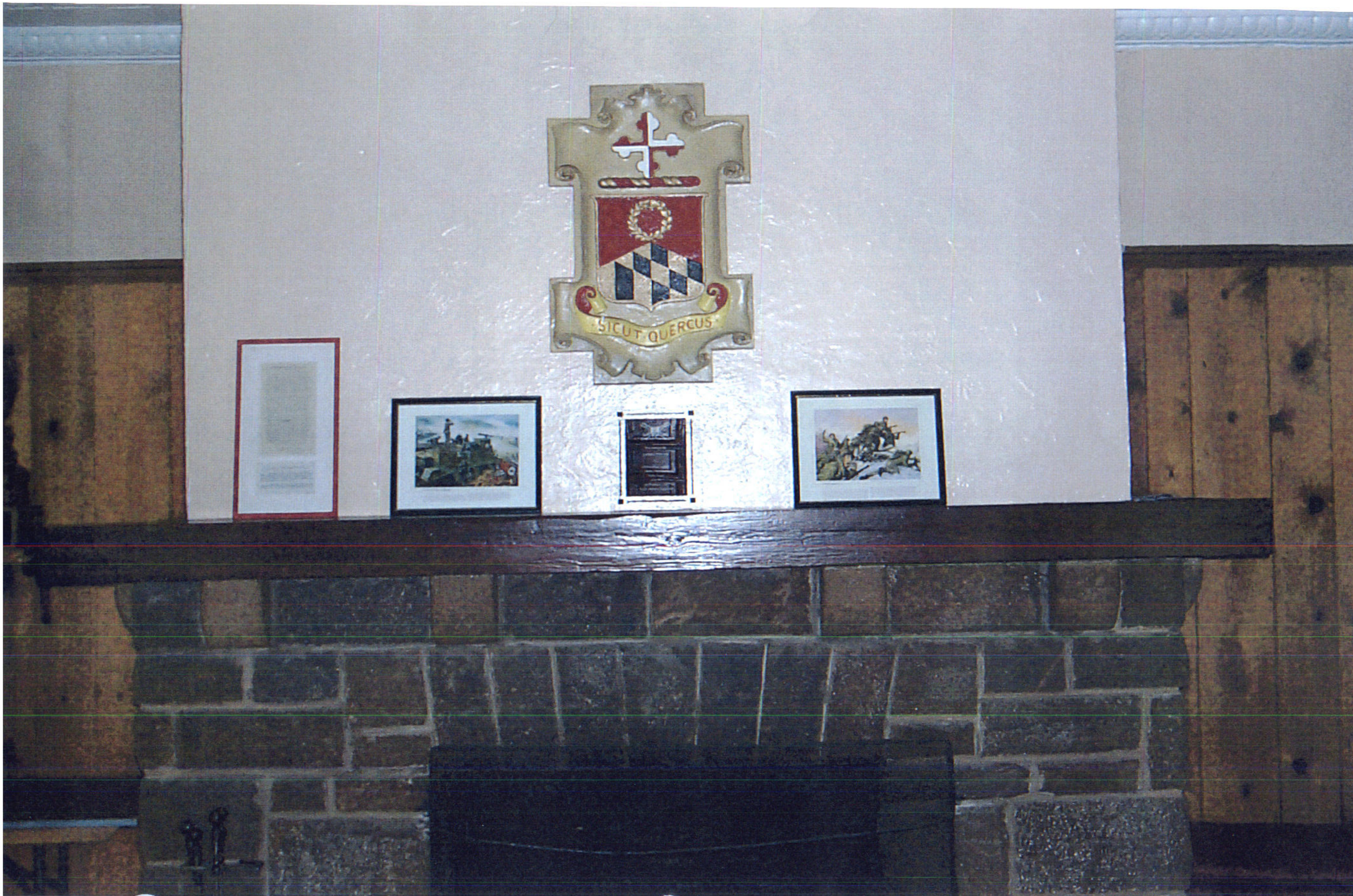

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APPENDIX C

SAMPLING SHEETS AND LABORATORY ANALYSES

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Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211
(303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

August 8, 2003

Laboratory Code:	**RES**
Subcontract Number:	**NA**
Laboratory Report:	**RES 96061-1**
Project Description:	**None Given**
	None Given

[redacted]
Army National Guard IH - West
3401 Quebec Street, Suite 7200
Denver CO 80207

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association, Lab ID 101533 - Accreditation Certificate #480. The laboratory is currently proficient in both PAT & ELPAT programs respectively.

Reservoirs has analyzed the following sample(s) using Atomic Emission Spectroscopy - Inductively Coupled Plasma (AES-ICP) per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the analysis table. Results have been sent to your office.

RES 96061-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you should have any questions about this report, please feel free to call me at 303-964-1986.

Sincerely,

[redacted]

President

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RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD BY WIPE SAMPLING

RES Job Number:	**RES 96061-1**
Client:	**Army National Guard IH - West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**None Given**
Date Samples Received:	**July 30, 2003**
Analysis Type:	**USEPA SW846 3050B / AA(7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 4, 2003**

Client ID Number	Lab ID Number	Sample Area (sq ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
PI Blank 1	EM 800587	0.11	BDL	23	BDL
PI Blank 2	EM 800588	0.11	BDL	23	BDL
PI Blank 3	EM 800589	0.11	BDL	23	BDL
PI Blank 4	EM 800590	0.11	BDL	23	BDL
PI W16	EM 800591	0.11	22.8	23	207
PI W17	EM 800592	0.11	14.2	23	129
PI W18	EM 800593	0.11	56.2	23	511
PI W19	EM 800594	0.11	26.2	23	238
PI W20	EM 800595	0.11	10.1	23	92
PI W21	EM 800596	0.11	BDL	23	BDL
PI W22	EM 800597	0.11	BDL	23	BDL
PI W23	EM 800598	0.11	BDL	23	BDL
PI W24	EM 800599	0.11	BDL	23	BDL
PI W25	EM 800600	0.11	BDL	23	BDL
PI Blank 5	EM 800601	0.11	BDL	23	BDL
PI Blank 6	EM 800602	0.11	BDL	23	BDL
DK Blank 01	EM 800603	0.11	BDL	23	BDL
DK W01	EM 800604	0.11	BDL	23	BDL
DK W02	EM 800605	0.11	BDL	23	BDL
DK W03	EM 800606	0.11	BDL	23	BDL
DK W04	EM 800607	0.11	BDL	23	BDL
DK W05	EM 800608	0.11	5200.0	23	47273
DK W06	EM 800609	0.11	107.0	23	973
DK W07	EM 800610	0.11	37.8	23	344
DK W08	EM 800611	0.11	BDL	23	BDL
DK W09	EM 800612	0.11	7.2	23	65
DK W10	EM 800613	0.11	57.0	23	518
DK Blank 02	EM 800614	0.11	BDL	23	BDL
DK W11	EM 800615			Sample not submitted	
DK Blank 03	EM 800616	0.11	BDL	23	BDL

BDL = Below Detection Limit

Data Qa ____________

Reservoirs Environmental, Inc.

2059 Bryant St.   Denver, CO 80211
(303) 964-1986   Fax (303) 477-4275   Toll Free (866) RESI-ENV

REMIT TO: 2059 Bryant St. Denver, CO 80211

Invoice to: Army National Guard IH - West 3401 Quebec Street, Suite 7200 Denver CO 80207	**Invoice Date:** August 8, 2003 **Invoice Number:** 96061-1 **TERMS:** Net 30 Days Service Charge of 18% per annum may by charged on past due invoices.

Quantity	Analytical Procedure				Unit Price	Amount
	RES Job #:	96061-1				
	Desc:	None Given				
	Submitted By:	Army National Guard IH - West				
	P/O No:	None Given				
	Contact:	Non-Responsive [redacted]				
30	AA/ICP Metal	Wipe	3-5 Day	4125-02	$7.50	$225.00
					Invoice Total:	$225.00

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RESERVOIRS ENVIRONMENTAL, INC.

2059 Bryant St., Denver CO 80211

RES 96061

RESI Job #: PAGE 1

Page ___ of ___

Due Date: ______

Due Time: ______

SAMPLES SUBMITTED BY:	INVOICE TO: (IF DIFFERENT)
Company: USACHPPM	MD NGB
Address:	
Contact: Phone:	Fax: Pager:
Contact: Phone:	Fax: Pager:
Project Number and/or P.O. #:	[redacted]
Project Description/Location:	

After Hours/Weekend CHARGE: Amount $______ Authorized by: ______

[redacted]@ng.army.mil

Additional fees apply for after hours and holidays for all analysis types. Samples will be analyzed during normal laboratory hours unless otherwise arranged and specified on the chain of custody. Turnaround is subject to laboratory volume. You will be notified if delays are expected.

ASBESTOS LABORATORY HOURS: Weekdays: 7am - 7pm

PCM/PLM ___ 2 Hour RUSH ___ 24 hour ___ 3-5 weekdays

TEM ___ 6 Hour RUSH ___ 24 hour ___ 3-5 weekdays

Prior Notice REQUIRED for TEM 6 Hour RUSH

METALS LABORATORY HOURS: Weekdays: 8am - 5pm

AA ___ SPECIAL RUSH ___ 24 Hour ___ 3-5 Day

RCRA 8 ___ SPECIAL RUSH ___ 5 Day ___ 10 Day

TCLP ___ SPECIAL RUSH ___ 5 Day ___ 10 Day

Prior Notice REQUIRED for SPECIAL RUSH AA, RCRA or TCLP

RCRA and TCLP SPECIAL RUSH is 3 Day Turnaround

ANALYTICAL METHOD

AIR: PCM 7400A, 7400B, OSHA; TEM AHERA, Level II, 7402, ISO, Pres/Abs ISO-Indirect Preps Chatfield; AA / ICP ___ Metal ___ RCRA 8; Dust Total, Respirable

BULK: PLM Short report, Long report, Point Count; TEM +/-, Quant, Semi-quant; AA / ICP ___ Metal ___ RCRA 8; Paint, Soil, Dust, Wipe, TCLP (ASTM E 1792 approved wipes only.)

WATER: TEM Drinking, Waste Water; AA Water ___ Metal ___ RCRA 8; Drinking, Waste Water

OTHER: Specify ______

Special Instructions: ______

	Client Sample Number	Volume	EM #
1.	PI BLANK 1		800387
2.	PI BLANK 2		88
3.	PI BLANK 3		89
4.	PI BLANK4		90
5.	PI W16		91
6.	PI W17		92
7.	PI W18		93
8.	PI W19		94
9.	PI W20		95
10.	PI W21		96
11.	PI W22		97
12.	PI W23		98
13.	PI W24		99
14.	PI W25		600
15.	PI BLANK 5		01

Number of samples received: ______ (Use as many additional sheets as needed.)

NOTE: If the package has sustained substantial damage or the custody seal is broken, stop and contact project manager and shipper. RESI will analyze incoming samples based upon information received with those samples. REI is not responsible for errors or omissions in calculations resulting from the inaccuracy of original data. Turnaround times are based upon times of re[redacted] ...of samples guaranteed in short turnaround.

Relinquished By: [redacted] Date/Time: 28 July 2003

Laboratory Use Only						Date/Time:		
Received By:								
Carrier:		Condition of package/custody seal upon receipt:						
RESULTS:	Contact	Page	Phone	Fax	Email	Date	Time	Initials

SPLITS:	Authorization By/Time:		Lab Bench/Count Sheets Received By:
	Analytical Method/Turnaround:		Time: Date:
rev 5/2/01	Results Due:	Results Out:	

Phone: (303) 964-1986 Fax: (303) 477-4275 WATS: 1-866-RESI ENV (737-4368)

PAGER: ONCALL Pager number available at Lab. Alternate Pagers: PLM/TEM 509-2187 PCM/Metals 509-2098 (AFTER HOURS USE ONLY)

RESERVOIRS ENVIRONMENTAL, INC.

2059 Bryant St., Denver CO 80211

RESI Job #: 96061 PAGE 2

Due Date: ______

Due Time: ______

Page ___ of ___

SAMPLES SUBMITTED BY:	INVOICE TO: (IF DIFFERENT)
Company: USACHPPM	MD NGB
Address:	
Contact: Phone:	Fax: Pager:
Contact: Phone:	Fax: Pager:
Project Number and/or P.O. #:	[redacted] @apg.amedd.army.mil
Project Description/Location:	

After Hours/Weekend CHARGE: Amount $______ Authorized by: ______

Additional fees apply for after hours and holidays for all analysis types. Samples will be analyzed during normal laboratory hours unless otherwise arranged and specified on the chain of custody. Turnaround is subject to laboratory volume. You will be notified if delays are expected.

ASBESTOS LABORATORY HOURS: Weekdays: 7am - 7pm

PCM/PLM ___ 2 Hour RUSH ___ 24 hour ___ 3-5 weekdays

TEM ___ 6 Hour RUSH ___ 24 hour ___ 3-5 weekdays

Prior Notice REQUIRED for TEM 6 Hour RUSH

METALS LABORATORY HOURS: Weekdays: 8am - 5pm

AA ___ SPECIAL RUSH ___ 24 Hour ___ 3-5 Day

RCRA 8 ___ SPECIAL RUSH ___ 5 Day ___ 10 Day

TCLP ___ SPECIAL RUSH ___ 5 Day ___ 10 Day

Prior Notice REQUIRED for SPECIAL RUSH AA, RCRA or TCLP

RCRA and TCLP SPECIAL RUSH is 3 Day Turnaround

ANALYTICAL METHOD

AIR: [ ] PCM 7400A, 7400B, OSHA
[ ] TEM AHERA, Level II, 7402, ISO, Prec/Abs ISO-Indirect Preps Chatfield
[ ] AA / ICP ______ Metal ___ RCRA 8
[ ] Dust Total, Respirable

BULK: [ ] PLM Short report, Long report, Point Count
[ ] TEM +/-, Quant, Semi-quant
[✓] AA / ICP LEAD Metal ___ RCRA 8 Paint, Soil, Dust, Wipe, TCLP (ASTM E 1792 approved wipes only.)

WATER: [ ] TEM Drinking, Waste Water
[ ] AA Water ______ Metal ___ RCRA 8 Drinking, Waste Water

OTHER: [ ] Specify ______

Special Instructions: ______

	Client Sample Number	Volume	EM #
1.	PI BLANK 6		500602
2.	DK BLANK 01		03
3.	DK W01		04
4.	DK W02		05
5.	DK W03		06
6.	DK W04		07
7.	DK W05		08
8.	DK W06		09
9.	DK W07		10
10.	DK W08		11
11.	DK W09		12
12.	DK W10		13
13.	DK BLANK 02		14
14.	DK W11		15
15.	DK BLANK 03		16

Number of samples received: ______ (Use as many additional sheets as needed.)

NOTE: If the package has sustained substantial damage or the custody seal is broken, stop and contact project manager and shipper. RESI will analyze incoming samples based upon information received with those samples. RESI is not responsible for errors or omissions in calculations resulting from the inaccuracy of original data. Turnaround times are based upon times of receipt by Laboratory. Call Laboratory for number of samples guaranteed in short turnaround.

Relinquished By: [redacted] Date/Time: 28 July 2003

Laboratory Use Only

Received By: ______ Date/Time: ______

Carrier: ______ Condition of package/custody seal upon receipt: ______

RESULTS: ___ Contact Page Phone Fax Email Date Time Initials

SPLITS: ___ Authorization By/Time: ______ Lab Bench/Count Sheets Received By:

Analytical Method/Turnaround: ______ Time: Date:

Results Due: ______ Results Out: ______

rev 6/2/01

Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211
(303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

August 7, 2003

Laboratory Code:	**RES**
Subcontract Number:	**NA**
Laboratory Report:	**RES 96063-1**
Project Description:	**None given**
	None given

[redacted]
Army National Guard IH - West
3401 Quebec Street, Suite 7200
Denver CO 80207

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association, Lab ID 101533 - Accreditation Certificate #480. The laboratory is currently proficient in both PAT & ELPAT programs respectively.

Reservoirs has analyzed the following sample(s) using Atomic Emission Spectroscopy - Inductively Coupled Plasma (AES-ICP) per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the analysis table. Results have been sent to your office.

RES 96063-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you should have any questions about this report, please feel free to call me at 303-964-1986.

Sincerely,

[redacted]

President

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD BY WIPE SAMPLING

RES Job Number: **RES 96063-1**
Client: **Army National Guard IH - West**
Client Project Number / P.O.: **None given**
Client Project Description: **None given**
Date Samples Received: **July 30, 2003**
Analysis Type: **USEPA SW846 3050B / AA(7420)**
Turnaround: **3-5 Day**
Date Samples Analyzed: **August 4, 2003**

Client ID Number	Lab ID Number	Sample Area (sq ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
PI W01	EM 800631	0.11	BDL	23	BDL
PI W02	EM 800632	0.11	BDL	23	BDL
PI W03	EM 800633	0.11	2.9	23	26
PI W04	EM 800634	0.11	BDL	23	BDL
PI W05	EM 800635	0.11	708.0	23	6436
PI W06	EM 800636	0.11	82.2	23	747
PI W07	EM 800637	0.11	4.3	23	39
PI W08	EM 800638	0.11	1520.0	23	13818
PI W09	EM 800639	0.11	15.0	23	136
PI W10	EM 800640	0.11	50.1	23	455
PI W11	EM 800641	0.11	BDL	23	BDL
PI W12	EM 800642	0.11	BDL	23	BDL
PI W13	EM 800643	0.11	BDL	23	BDL
PI W14	EM 800644	0.11	BDL	23	BDL
PI W15	EM 800645	0.11	BDL	23	BDL

***Calculations Based On A 1 sq.ft. Sample Area Unless Otherwise Noted**

BDL = Below Detection Limit

Data Qa ___________

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RESERVOIRS ENVIRONMENTAL, INC.

2059 Bryant St., Denver CO 80211

RESI Job #: RES 96063

Due Date:

Due Time:

Page ___ of ___

SAMPLES SUBMITTED BY:	INVOICE TO: (IF DIFFERENT)
Company: USACHPPM	MD NGB
Address:	
Contact: Phone:	Fax: Pager:
Contact: Phone:	Fax: Pager:
Project Number and/or P.O. #:	[redacted]
Project Description/Location:	

@apg.amedd.army.mil

After Hours/Weekend CHARGE: Amount $ ____ Authorized by: ____

Additional fees apply for after hours and holidays for all analysis types. Samples will be analyzed during normal laboratory hours unless otherwise arranged and specified on the chain of custody. Turnaround is subject to laboratory volume. You will be notified if delays are expected.

ASBESTOS LABORATORY HOURS: Weekdays: 7am - 7pm

PCM/PLM ___ 2 Hour RUSH ___ 24 hour ___ 3-5 workdays

TEM ___ 6 Hour RUSH ___ 24 hour ___ 3-5 weekdays

Prior Notice REQUIRED for TEM 6 Hour RUSH

METALS LABORATORY HOURS: Weekdays: 8am - 5pm

AA ___ SPECIAL RUSH ___ 24 Hour ___ 3-5 Day

RCRA 8 ___ SPECIAL RUSH ___ 5 Day ___ 10 Day

TCLP ___ SPECIAL RUSH ___ 5 Day ___ 10 Day

Prior Notice REQUIRED for SPECIAL RUSH AA, RCRA or TCLP

RCRA and TCLP SPECIAL RUSH is 3 Day Turnaround

ANALYTICAL METHOD

AIR: ☐ PCM 7400A, 7400B, OSHA; TEM AHERA, Level II, 7402, ISO, Pres/Abs ISO-Indirect Preps Chatfield
☐ AA / ICP ___ Metal ___ RCRA 8; Dust Total, Respirable

BULK: ☐ PLM Short report, Long report, Point Count; TEM +/-, Quant, Semi-quant
☑ AA / ICP Lead Metal ___ RCRA 8; Paint, Soil, Dust, Wipe, TCLP (ASTM E 1792 approved wipes only.)

WATER: ☐ TEM Drinking, Waste Water; AA Water ___ Metal ___ RCRA 8; Drinking, Waste Water

OTHER: ☐ Specify ___

Special Instructions:

	Client Sample Number	Volume	EM #
1.	PI W01		800631
2.	PI W02		32
3.	PI W03		33
4.	PI W04		34
5.	PI W05		35
6.	PI W06		36
7.	PI W07		37
8.	PI W08		38
9.	PI W09		39
10.	PI W10		40
11.	PI W11		41
12.	PI W12		42
13.	PI W13		43
14.	PI W14		44
15.	PI W15		45

Number of samples received: ____ (Use as many additional sheets as needed.)

NOTE: If the package has sustained substantial damage or the custody seal is broken, stop and contact project manager and shipper. RESI will analyze incoming samples based upon information received with those samples. RESI is not responsible for errors or omissions in calculations resulting from the inaccuracy of original data. Turnaround times are based upon times of receipt by Laboratory. Call Laboratory for number of samples guaranteed in short turnaround.

Relinquished By: [redacted] Date/Time: 28 July 2003

Laboratory Use Only

Received By: ____ Date/Time: ____

Carrier: ____ Condition of package/custody seal upon receipt: ____

RESULTS: Contact Page Phone Fax Email Date Time Initials

SPLITS: Authorization By/Time: ____ Lab Bench/Count Sheets Received By: ____

Analytical Method/Turnaround: ____ Time: ____ Date: ____

Results Due: ____ Results Out: ____

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PAGER: ONCALL Pager number available at Lab. Alternate Pagers: PLM/TEM 509-2187 PCM/Metals 509-2098 (AFTER HOURS USE ONLY)

Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211
(303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

REMIT TO: 2059 Bryant St. Denver, CO 80211

Invoice to:

Army National Guard IH - West
3401 Quebec Street, Suite 7200
Denver CO 80207

Invoice Date: August 7, 2003
Invoice Number: 96063-1

TERMS: Net 30 Days

Service Charge of 18% per annum may by charged on past due invoices.

Quantity	Analytical Procedure				Unit Price	Amount
	RES Job #:	96063-1				
	Desc:	None given				
	Submitted By:	Army National Guard IH - West				
	P/O No:	None given				
	Contact:	Non-Responsive [redacted]				
15	AA/ICP Metal	Wipe	3-5 Day	4125-02	$7.50	$112.50

Invoice Total: $112.50

APPENDIX D

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE

ASSESSMENT CRITERIA FOR LEAD

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Table 1 Lead Surface Wipe Samples

Wipe Sample #	Armory	City	Indoor Range Info: Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (µg/ft²)
			No			No		
PIW01	Pikesville	Pikesville					Main Drill Floor near Center Exit	BDL
PIW02	Pikesville	Pikesville					Bleacher near classroom #4	BDL
PIW03	Pikesville	Pikesville					Door to Kitchen & Smoking area from armory	26
PIW04	Pikesville	Pikesville					Top of ice maker in canteen area	BDL
PIW05	Pikesville	Pikesville					Former IFR bullet trap floor	6436
PIW06	Pikesville	Pikesville					Former IFR bench near former supply plenum	747
PIW07	Pikesville	Pikesville					Floor one foot outside door to former IFR	39
PIW08	Pikesville	Pikesville					Former IFR under radiator	13818
PIW09	Pikesville	Pikesville					Window sill near room 210	136
PIW10	Pikesville	Pikesville					Window sill in breakroom	455
PIW11	Pikesville	Pikesville					Room 8 (conference area) top of bookcase	BDL
PIW12	Pikesville	Pikesville					Step in Room 8 leading to Chief OPS SGT	BDL
PIW13	Pikesville	Pikesville					Recruitment Office Room 11 top of bookcase	BDL
PIW14	Pikesville	Pikesville					Room 11 top of switch station	BDL
PIW15	Pikesville	Pikesville					Room 21 on floor under fallen light fixture	BDL

Table 1 Lead Surface Wipe Samples

			Indoor Range Info					
Wipe Sample #	**Armory**	**City**	**Active**	**Inactive**	**N/A**	**Cleaned?**	**Location of Samples**	**Conc. (µg/ft²)**
PIW16	Pikesville	Pikesville					Floor in Vault area (Room # 8) second floor	207
PIW17	Pikesville	Pikesville					Floor vault area outside # 11	129
PIW18	Pikesville	Pikesville					Floor vault area near main door	511
PIW19	Pikesville	Pikesville					Window sill of PT area on third floor	238
PIW20	Pikesville	Pikesville					Floor of cage # 307 area third floor	92
PIW21	Pikesville	Pikesville					NCO Club fireplace mantle	BDL
PIW22	Pikesville	Pikesville					Kitchen counter NCO club	BDL
PIW23	Pikesville	Pikesville					Window sill second floor personnel office/ Merson Bldg	BDL
PIW24	Pikesville	Pikesville					Classroom floor corner/Merson Bldg	BDL
PIW25	Pikesville	Pikesville					Behind door to exit in corner of floor of Merson Bldg	BDL

APPENDIX E

LEAD CLEANING GUIDANCE

HUD TECHNICAL GUIDELINES FOR THE EVALUATION AND CONTROL OF LEAD-BASED PAINT HAZARDS IN HOUSING 1998

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CHAPTER 14: CLEANING

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
3. Have sufficient cleaning equipment and supplies *before* beginning work.
4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
13. Paint or otherwise seal treated surfaces and interior floors.
14. Conduct a clearance examination (see Chapter 15).
15. If clearance is not achieved, repeat the final cleaning.

Step-by-Step Summary (continued)

16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.
17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.
18. Cleaning equipment list:
    - HEPA vacuums.
    - Detergent.
    - Waterproof gloves.
    - Rags.
    - Sponges.
    - Mops.
    - Buckets.
    - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
    - 6-mil plastic bags.
    - Debris containers.
    - Waste water containers.
    - Shovels.
    - Rakes.
    - Water-misting sprayers.
    - 6-mil polyethylene sheeting (or equivalent).

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Chapter 14: Cleaning

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris *and* dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

✓ Is the critical importance of cleaning in a hazard control project understood?

✓ Have all workers been trained and certified for hazard control work?

✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?

✓ Have cleaning equipment and materials been obtained?

✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?

✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?

✓ Are all workers properly protected during the cleaning processes (see Chapter9)?

✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?

✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?

✓ Are the clearance criteria to be met fully understood?

✓ Have all appropriate surfaces been properly painted or otherwise sealed?

✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards *and* were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

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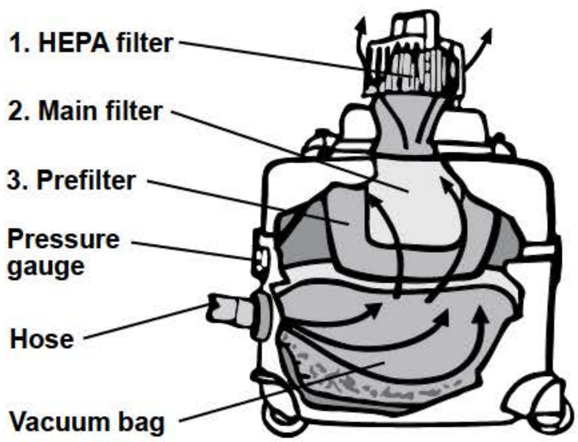
Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and pre-filter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the pre-filter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

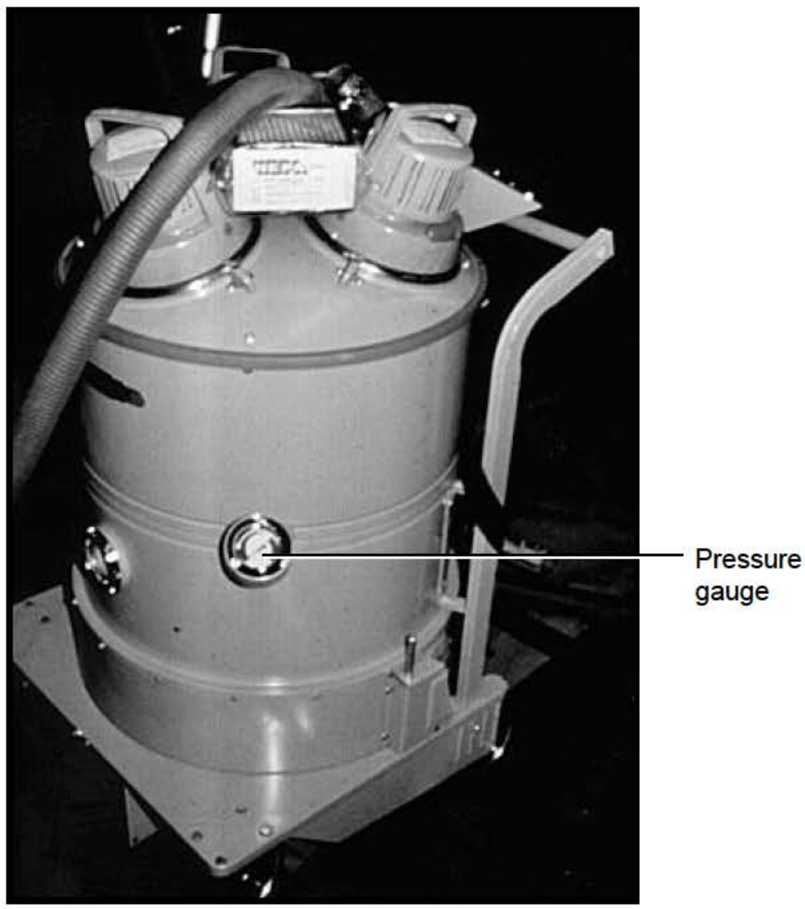
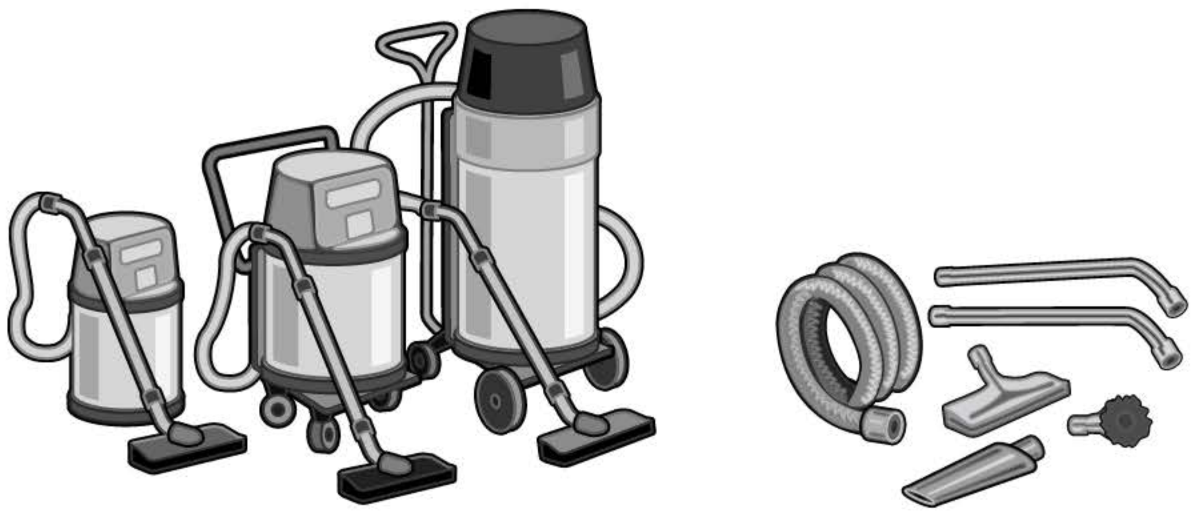


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

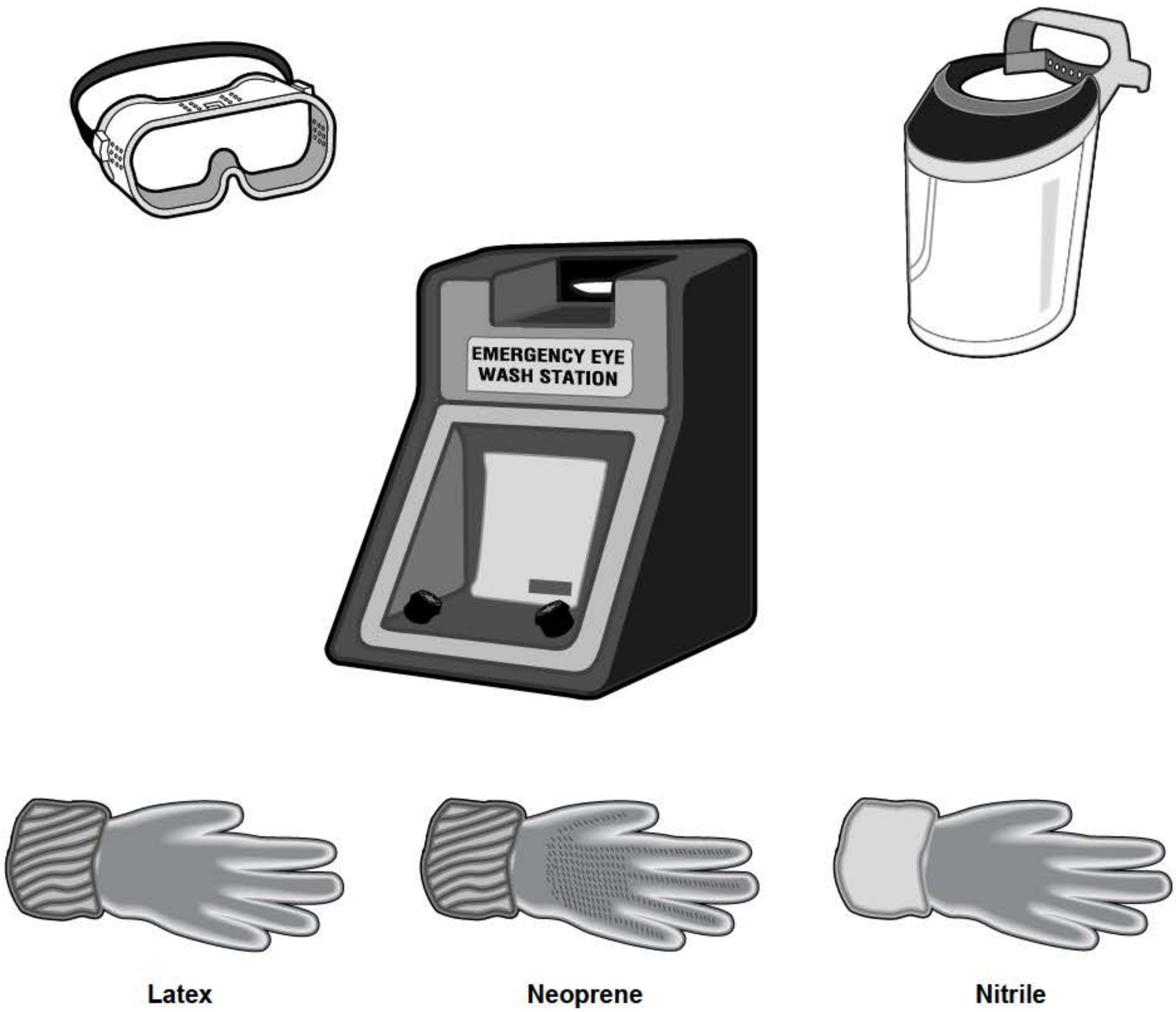
Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

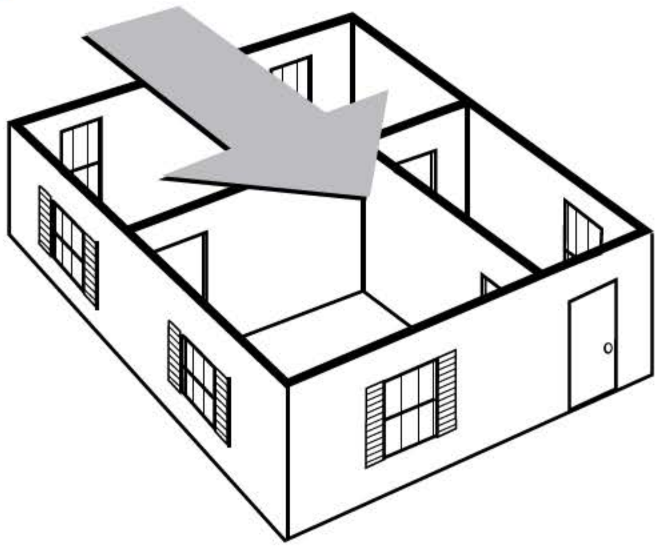
Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

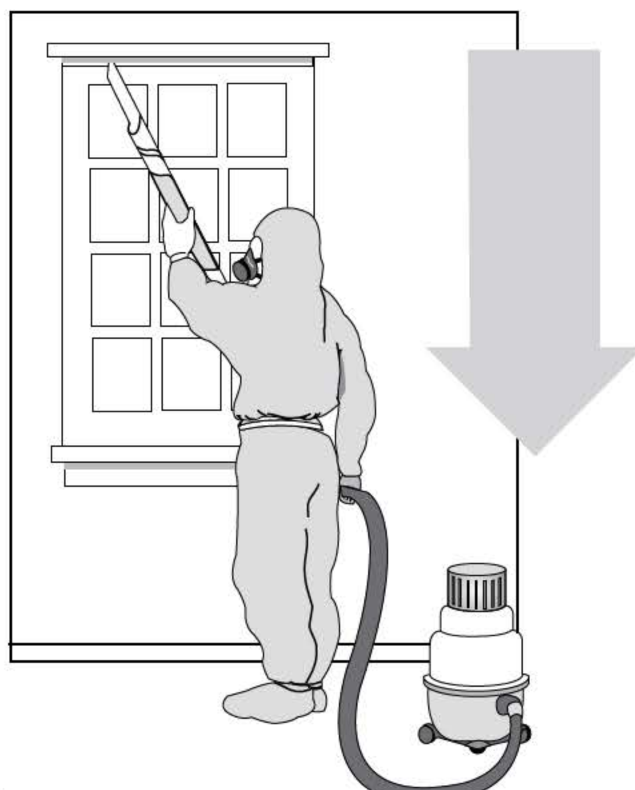
- First, the area is HEPA vacuumed.

Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on, and work down to the floor. Do every inch of the windows, especially the window troughs.



Courtesy: Alice Hamilton Occupational Health Center

- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.

Rubber Cone

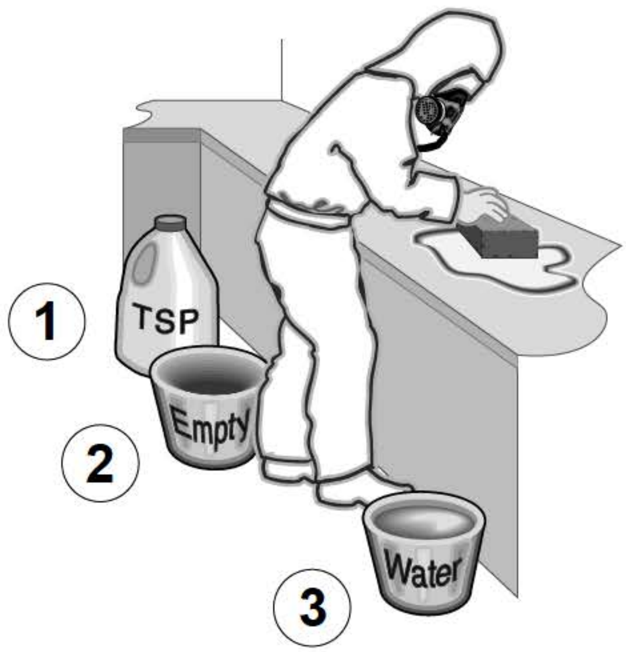
Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

Figure 14.4c (continued)

Wash all surfaces with suitable detergents
Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces

Wet Mop Floor

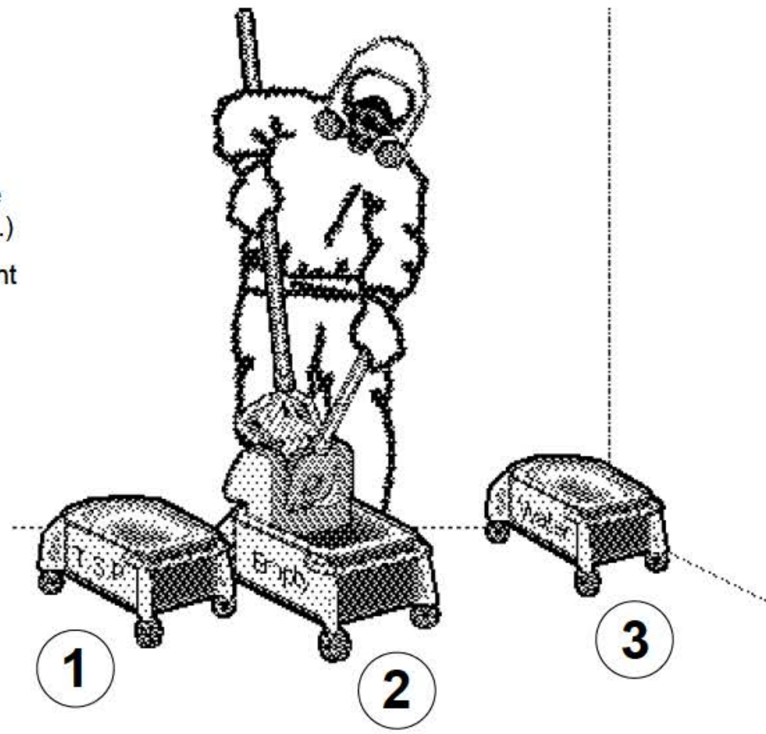
Don't Dry Sweep

Figure 14.4c (continued)

Use the 3-Bucket System.

To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.



Squeeze out the mophead in empty bucket #2. Return to bucket #1 for more detergent solution and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

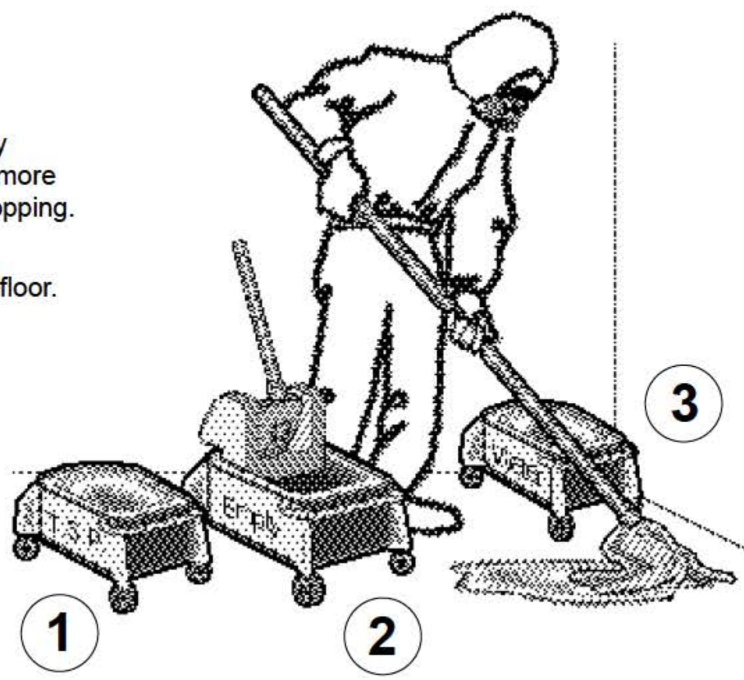
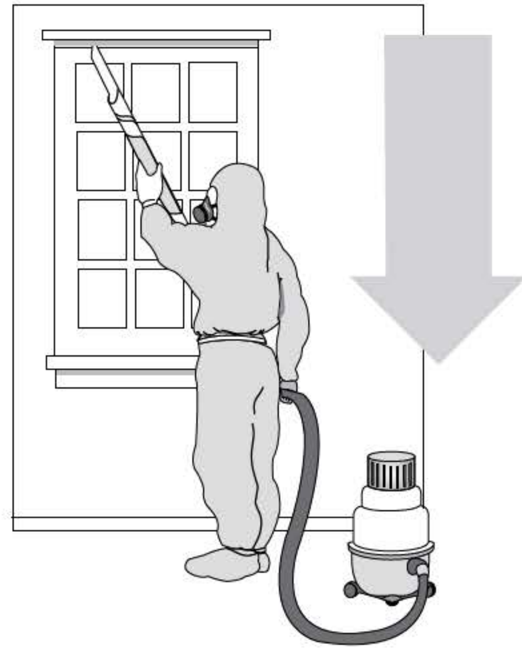


Figure 14.4d (continued)

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.

Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water *and cleaned*. All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).

Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This

option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dust-retaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table 14.1 Initial Cleaning Wipe-Test Failure Rates for Various Abatement Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)

and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993).

These *Guidelines* do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Cycle Number	Mass Removal Efficiency Percentages			
	Cleaning Method			
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.8	67.0	29.4
5	59.3	88.9	72.1	32.5
6	61.6	91.2	74.4	34.9
7	63.8	93.1	76.4	36.5
8	67.5	95.4	77.5	38.1
9	67.5	97.7	78.7	40.1
10	67.2	100.0	80.2	41.7
11		102.3	80.2	41.7
12		104.6	84.1	44.8
13		104.6	84.5	46.8
14		103.8	84.5	48.4
15				49.6
16				50.8
17				52.4
18				53.6
19				54.4
20				55.2

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) *Effectiveness of Clean-up Techniques for Leaded Paint Dust*

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APPENDIX F

MOLD GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

TG 277
FEBRUARY 2002

USACHPPM
Readiness thru Health
CONSERVARE SALUTEM

ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

Concern about indoor exposure to mold has been increasing as the public becomes more aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions.

This document provides the best and most current guidance for remediation of clean water damage (<48 hours) and mold contamination (>48 hours) into one resourceful Army guide. This guide has been designed to provide information to facilities management individuals who have little or no experience with mold remediation. It will assist them in making a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to develop or evaluate an in-house remediation plan or evaluate a remediation plan submitted by an outside contractor. If an outside contractor is employed, they must have experience cleaning up mold. Check their references, and have them follow the recommendations presented in this document, EPA guidelines, and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). A multi-disciplinary team approach to mold concerns is best. A health and safety professional, such as an industrial hygienist, should be consulted prior to any remediation activities to assist in the project.

Molds produce tiny spores to reproduce. Mold spores float through the indoor and outdoor air continually. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or uncorrected. There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.(1)

In all situations, the underlying cause of water accumulation must be rectified or mold growth will recur. Any initial water infiltration should be stopped and clean up began immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth. (Refer to Appendix A for detailed guidance on clean water damage response). If the source of water is elevated humidity, actions to maintain the relative humidity levels below 60% to inhibit mold growth should be taken (2). Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilating, and air-conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide adequate drainage and slope the ground away from the foundation.

REMEDIATION PLANNING

- Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Select cleanup methods for moldy items (Appendix B)
- Select Personal Protection Equipment (PPE)- protect remediators (Appendix B)
- Select containment equipment - protect building occupants (Appendix B)
- Select remediation personnel who have the experience and training needed to implement the remediation plan and use PPE and containment as appropriate

REMEDIATE MOISTURE AND MOLD PROBLEMS

- Fix moisture problem, implement repair plan and/or maintenance plan
- Dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Clean and dry moldy materials (Appendix B)
- Discard moldy porous items that can't be cleaned (Appendix B)

REMEDIATION PROCEDURES

Four levels of abatement are described below. The size of the area impacted by mold contamination primarily determines the type of remediation. The sizing levels below are based on professional judgment and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of mold and preventing dust contaminated with mold from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement. The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. (3)

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be discarded if possible. All materials to be reused should be dry and visibly free from mold. Routine inspections should be conducted to confirm the effectiveness of remediation work. (1 and 3)

The use of bleach or other biocides is questionable in most cases (8). The effectiveness of bleach in reducing living mold is dependent on concentration, residual chlorine levels, and contact time on the surface (8). All of these factors are difficult to control during remediation. Removal of all mold growth can generally be accomplished by physical removal of materials supporting active growth and thorough cleaning of non-porous materials (4). Therefore, application of a biocide serves no purpose that could not be accomplished with a detergent or cleaning agent (4).

The use of gaseous ozone or chlorine dioxide for remedial purposes is **not** recommended. Both compounds are highly toxic and contamination of occupied space may pose a health threat. Furthermore, the effectiveness of these treatments is unproven. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."(4)

FOUR REMEDIATION LEVELS

[Adapted from NYCDOH Guidelines on Assessment and Remediation of Fungi in Indoor Environments (3) and EPA (1)]

Level I: Small Isolated Areas – Total surface area affected less than 10 square feet - e.g., ceiling tiles, small areas on walls. Refer to Appendix B for detailed guidance.

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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.

Seal ventilation ducts/grills in the work area and areas directly adjacent with 6 mil polyethylene sheeting. Use an exhaust fan with a High Efficiency Particulate Air (HEPA) filter to generate negative pressurization.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and surrounding areas should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level III be followed.

Level III: Large Area – Total Surface Area affected greater than 100 square feet or potential for increased occupant or remediator exposure during remediation is estimated to be significant. (See Appendix B for detailed guidance).

The following procedures are recommended:

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from occupied spaces using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft^2) follow Level I guidance for PPE and containment and for a areas (>10 ft^2) follow Medium (Level II) or when greater than 100 ft^2 follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended (7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and removed in double-bagged 6-mil plastic. When a decontamination room is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

All areas should be left dry and visibly free from contamination and debris.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air (4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If remediation sampling is necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HAZARD COMMUNICATION

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.

3. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water Damage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£	
Water-Damaged Material†	**Actions**
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours§	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans.
Ceiling tiles	• Discard and replace.
Cellulose insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	• Discard and replace.

Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling should be pried away from wall for drying

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£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.
These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

† If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

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APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

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Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

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Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

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APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278
February 2002

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Table of Contents

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*[1] will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination[2].

Safety Tips While Investigating and Evaluating Mold and Moisture Problems[3]

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate[1].

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems[3].

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination[2].

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air[4]. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control[4]."

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program. For further mold assistance, contact USACHPPM, Industrial Hygiene Field Services Program, DSN 584-3118 or (410) 436-3118.

References

1. USACHPPM Technical Guide 277, *Army Facilities Management Information Document on Mold Remediation Issues*, February 2002.

2. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

3. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

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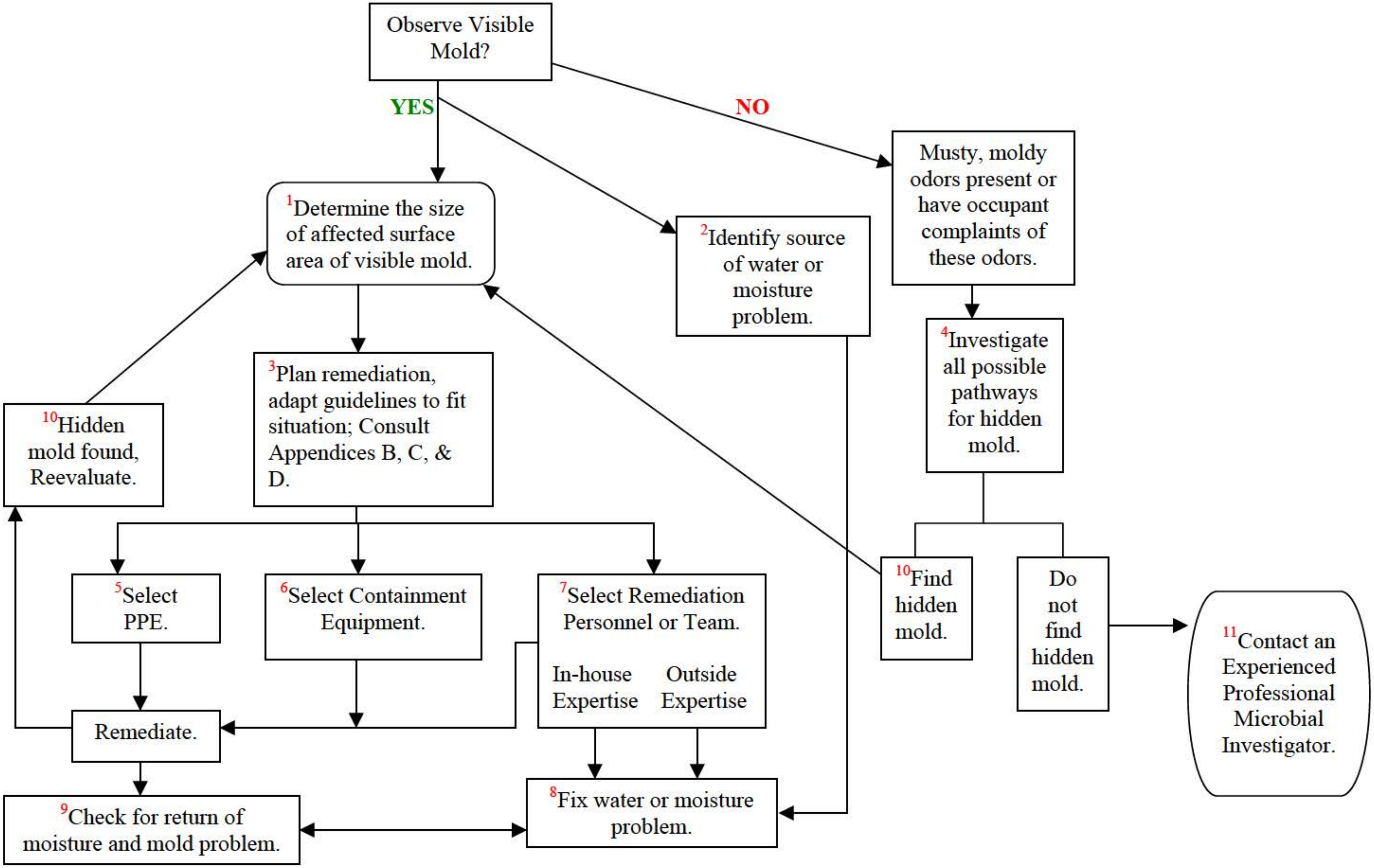
8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

MOLD INVESTIGATION DECISION LOGIC



MOLD INVESTIGATION DECISION LOGIC NOTES:

1. Roughly approximate the total surface area of visible mold. Categorization of the remediation levels are sometimes borderline, so when trying to decide the category to apply, consider the extent of visible growth, such as a heavy blanket of growth on the surface, to barely visible. If heavy growth is apparent, consider moving up to the next level of protection.

2. Do not skip this step. Address the source of water or moisture problem or the mold will simply reappear.

3. Always protect the health and safety of the building occupants and remediators.

4. Mold may be hiding on the backside of drywall, vinyl wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads. Check walls behind furniture, pipe chases and utility tunnels, porous thermal or acoustic liners inside ductwork, or check the rafters (due to roof leaks or insufficient insulation)[3].

5. Utilize appendices B and C for remediation guidance. Use your best judgment during investigations, if not disturbing the mold you may need minimal to no PPE. Do not alarm building occupants unnecessarily, but protect yourself as necessary.

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities[3]. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
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Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
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Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

®TYVEK, DuPont de Nemours, E.I., & Co., Wilmington, DE.

APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Readiness thru Health

CONSERVARE SALUTEM

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APPENDIX G

SITE MAPS

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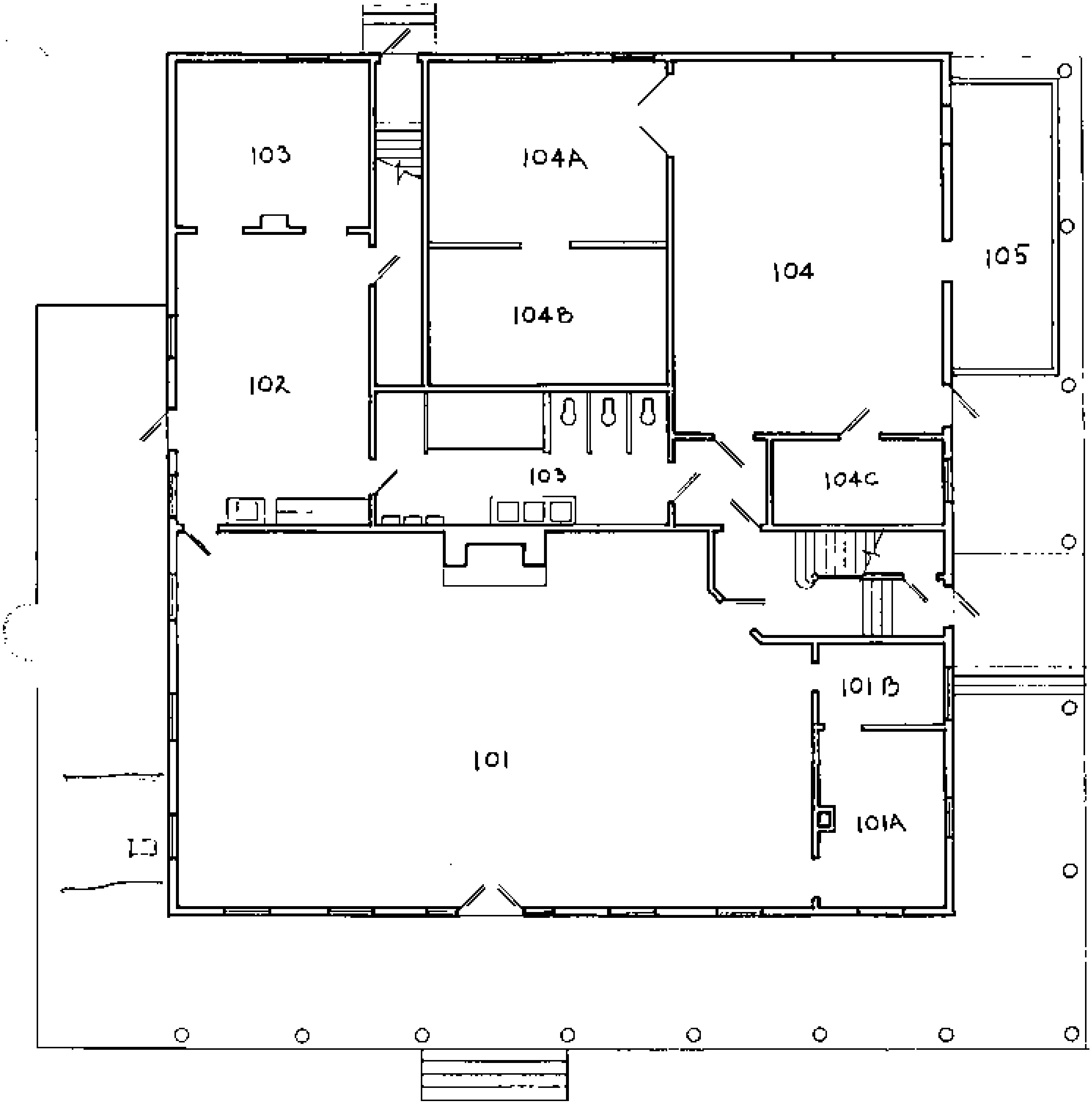
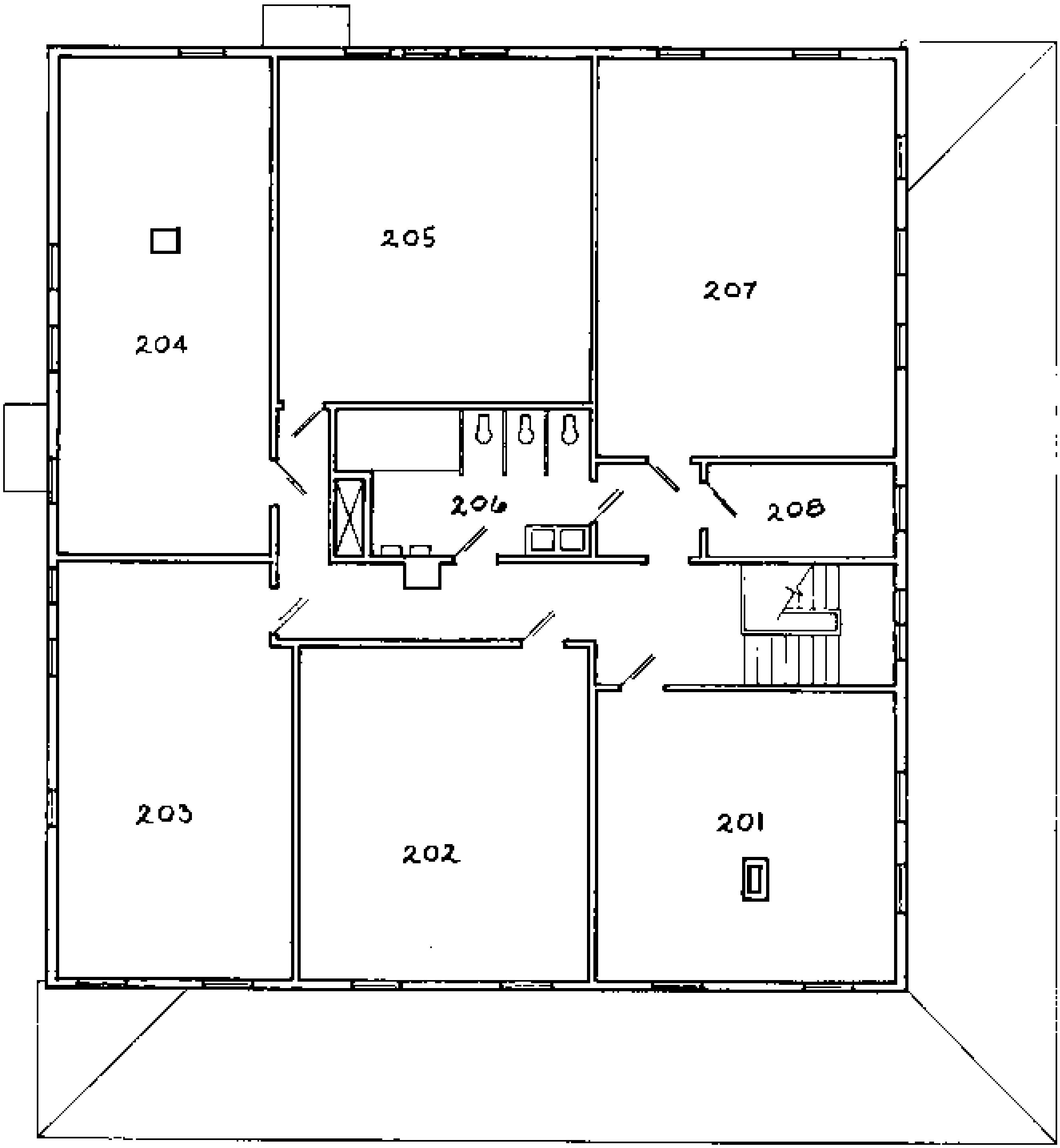


PIKESVILLE - N.C.O. CLUB

FIRST FLOOR PLAN
NO SCALE

27/10/95



PIKESVILLE - N.C.O. CLUB

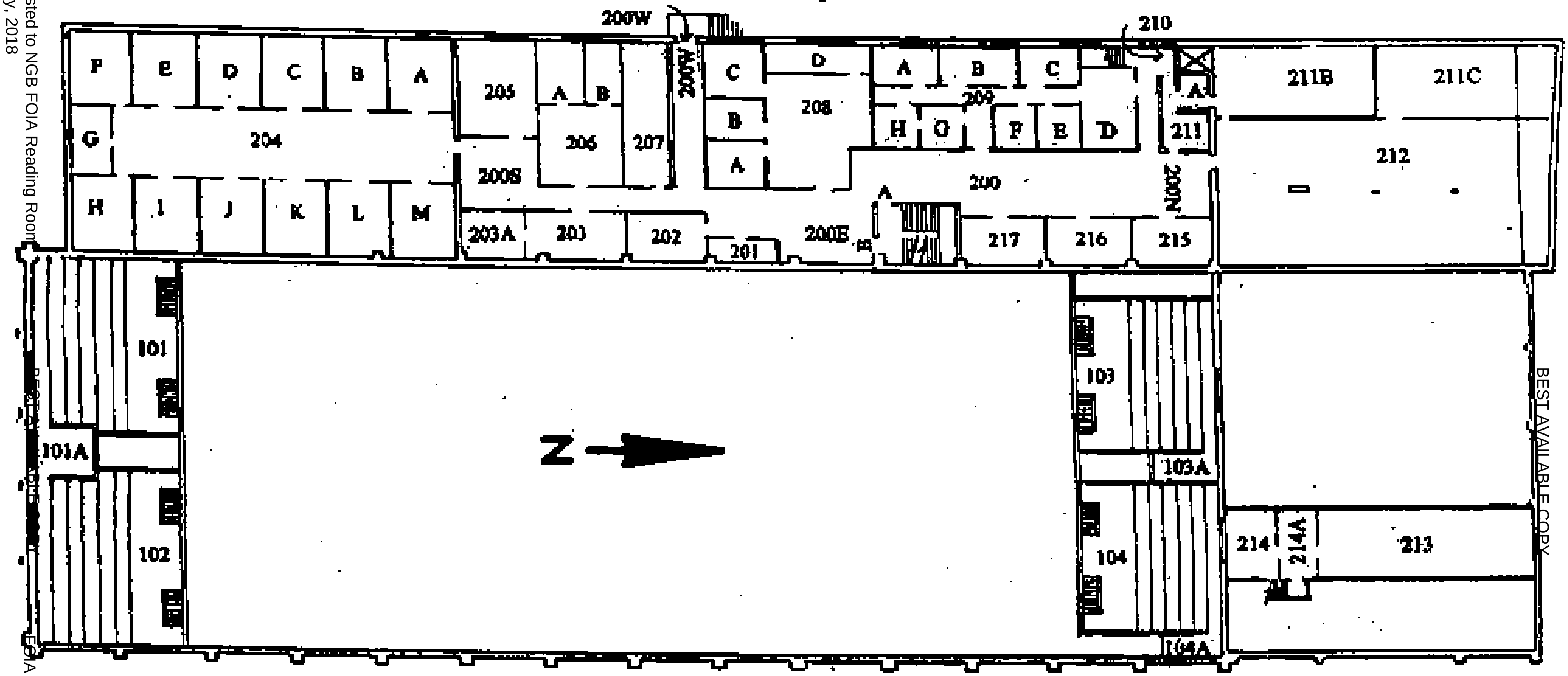
SECOND FLOOR PLAN
NO SCALE

27/10/95

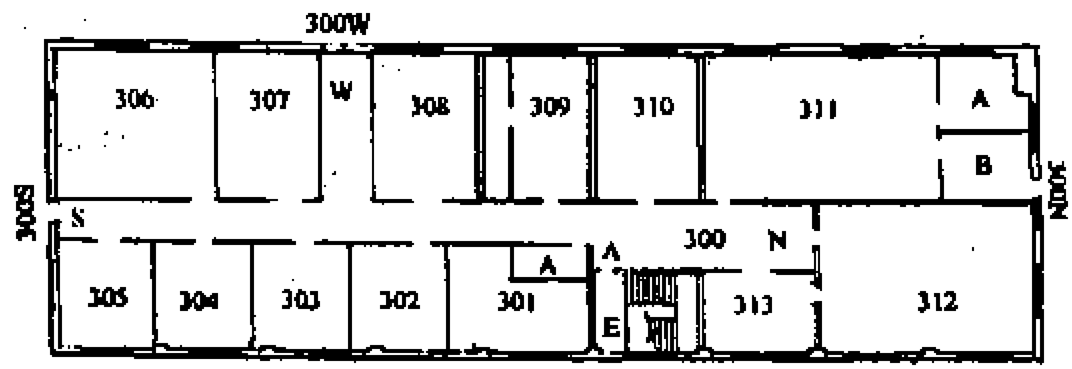
w'pe

MG JOHN PURLEY C[illegible]PER, JR. BUILDING
PIKESVILLE ARMORY

SECOND AND THIRD FLOOR PLAN
NOT TO SCALE



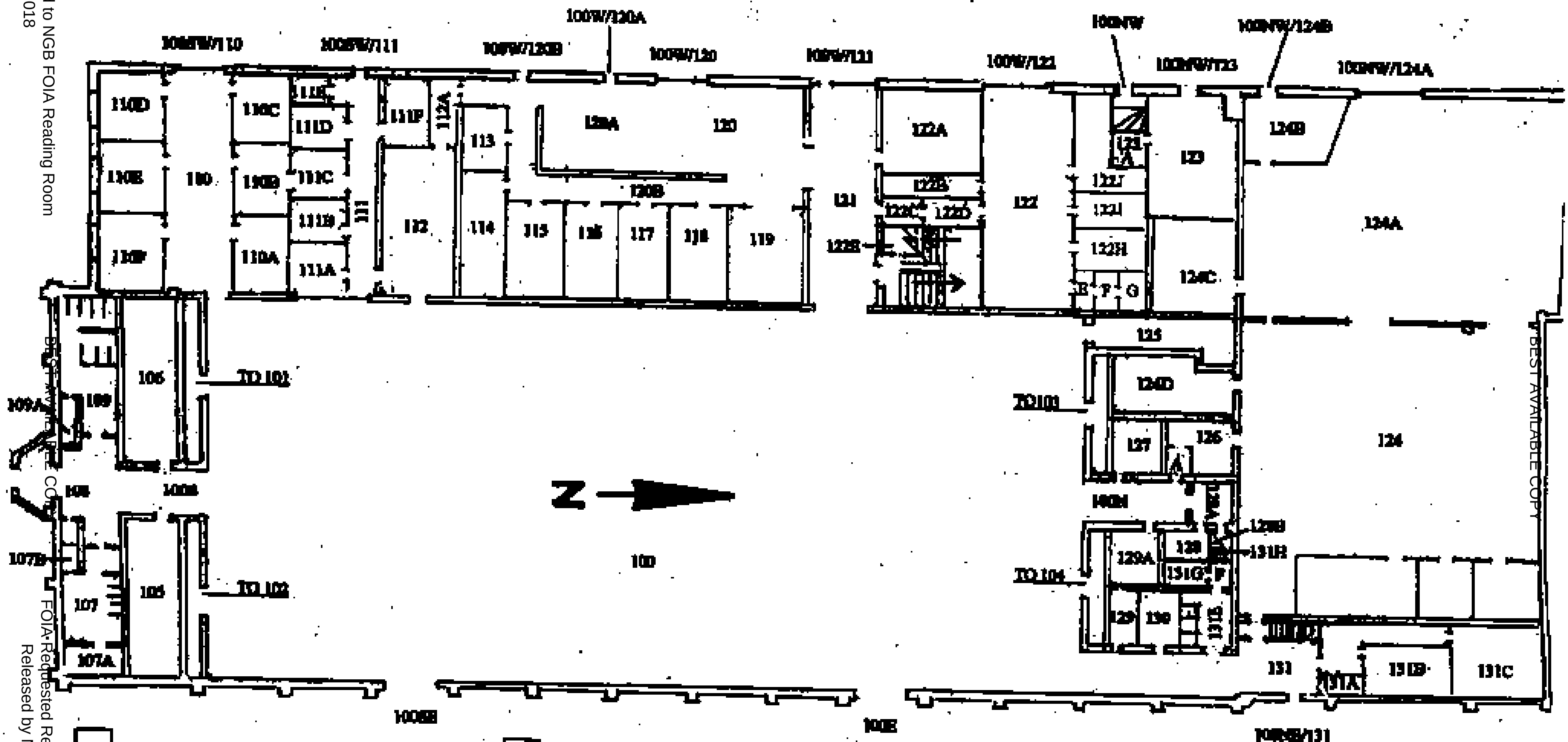
SECOND FLOOR



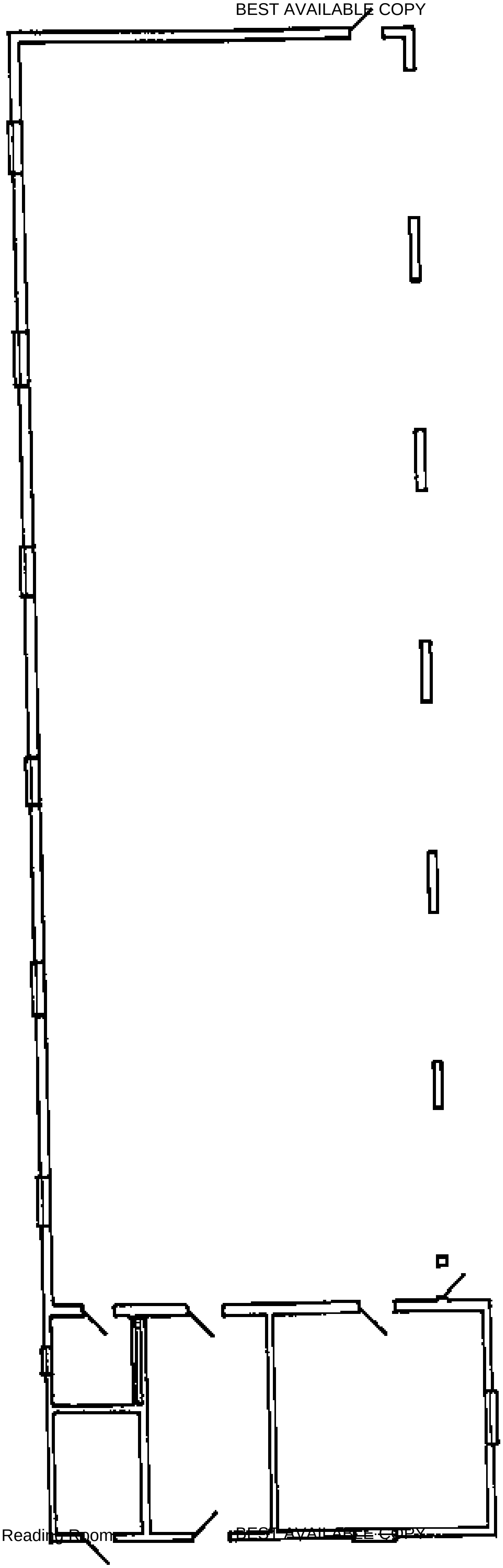
THIRD FLOOR

☐ RESERVATION	☐ HHS/2-110TH CONTROL
☐ HHC/3RD BDE CONTROL	☐ C/2-110 CONTROL
☐ 32D WMD CONTROL	☐ B/2-110 CONTROL
☐ 29TH JTFAT CONTROL	☐ B/175th CONTROL
☐ B/129TH SIGNAL CONTROL	☐ COMMON AREAS
☐ 243D ENGINEER CONTROL	

MG JOHN PURLEY COOPER, JR. BUILDING
PIKESVILLE ARMORY
FIRST FLOOR PLAN
NOT TO SCALE



- RESERVATION CCONTROL
- STATE SUPPLY CONTROL
- HHS/2-110TH FA CONTROL
- C/2-110TH FA CONTROL
- COMMON AREAS
- HHC/3RD BDE CONTROL
- B/129TH SIGNAL CONTROL
- DISTANCE EDUCATION CENTER



PIKESVILLE

O.M.S. FLOOR PLAN

NO SCALE

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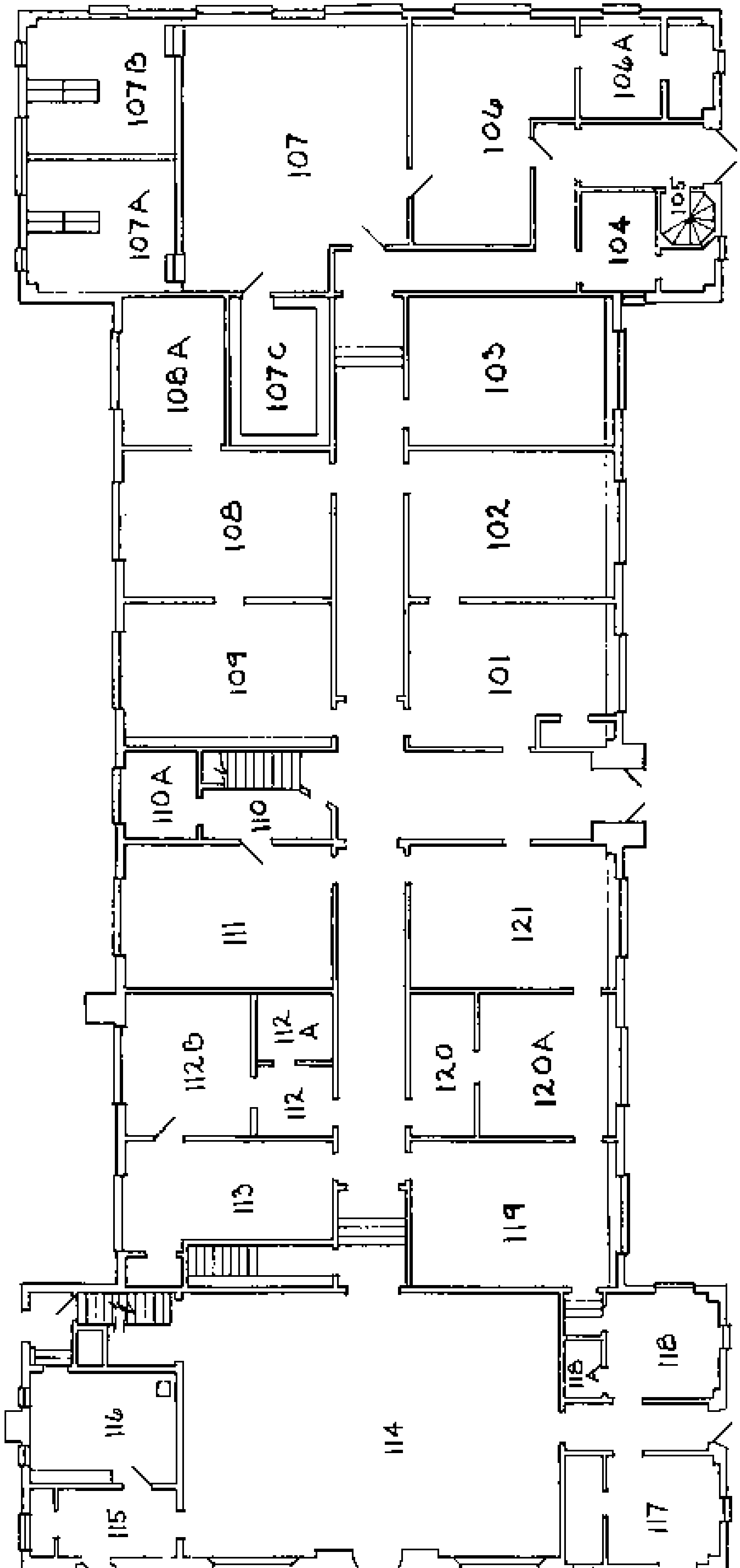

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PIKESVILLE ADMIN. 1
FIRST FLOOR PLAN
NO SCALE

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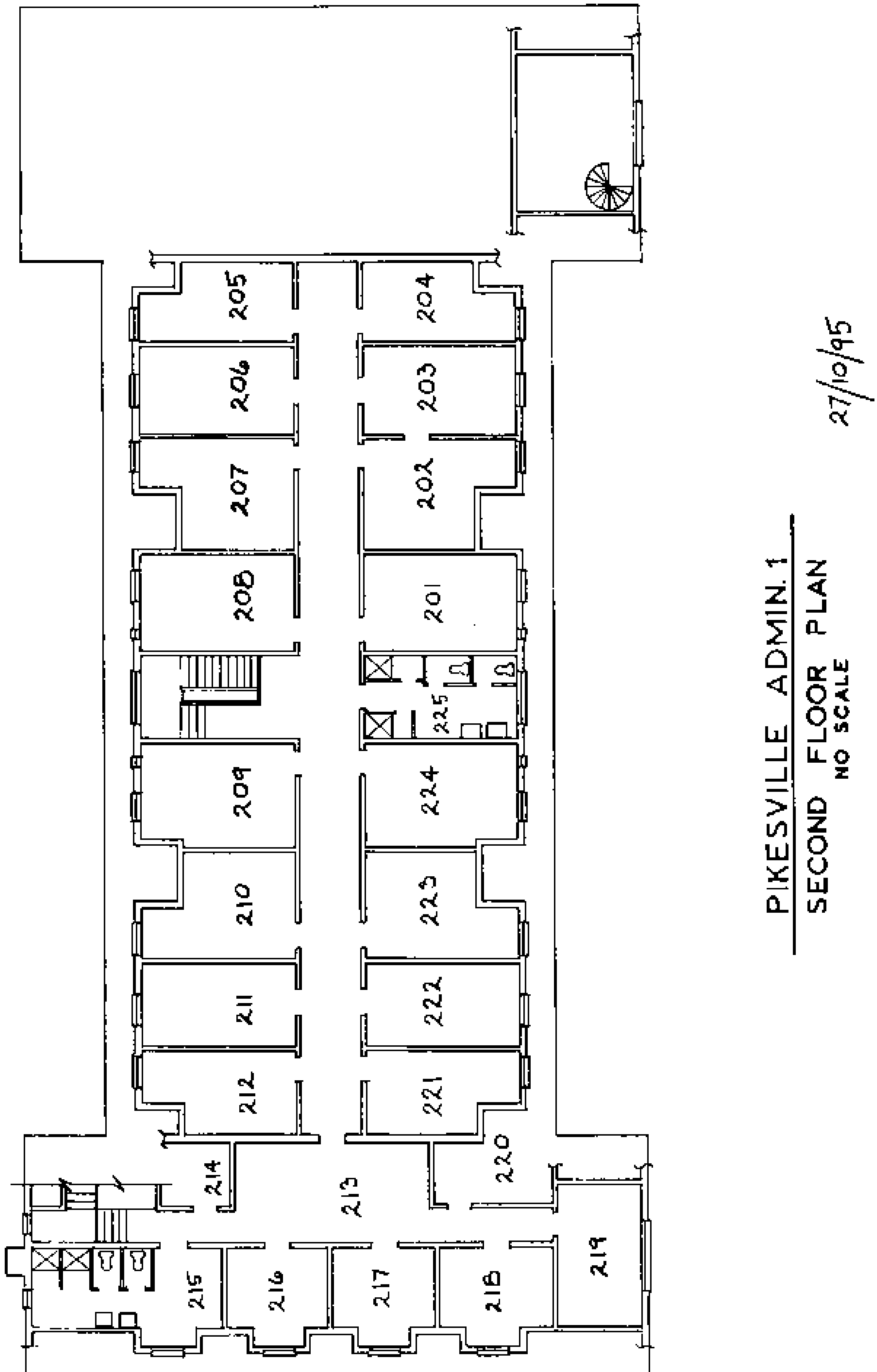

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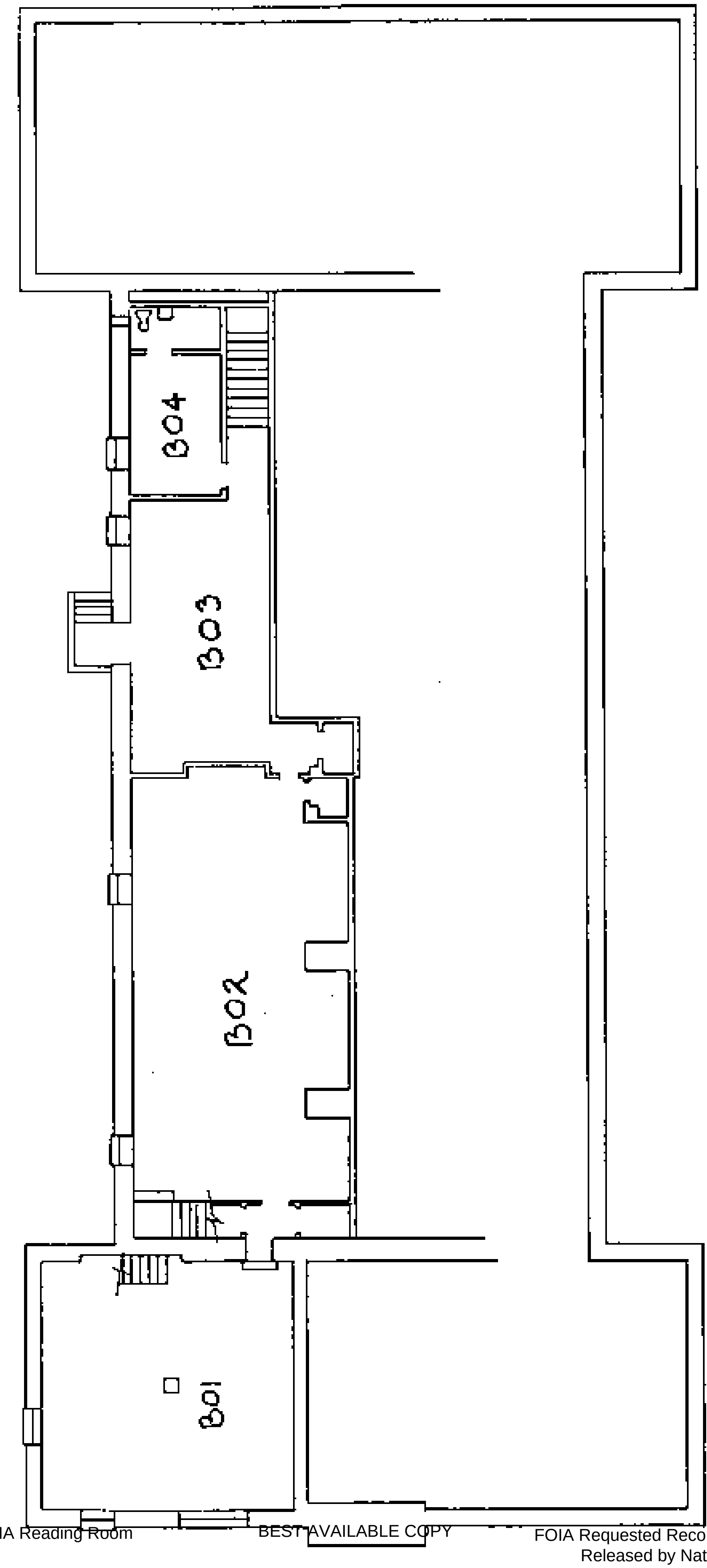

PIKESVILLE ADMIN. 1

BASEMENT FLOOR PLAN

NO SCALE

27/10/95

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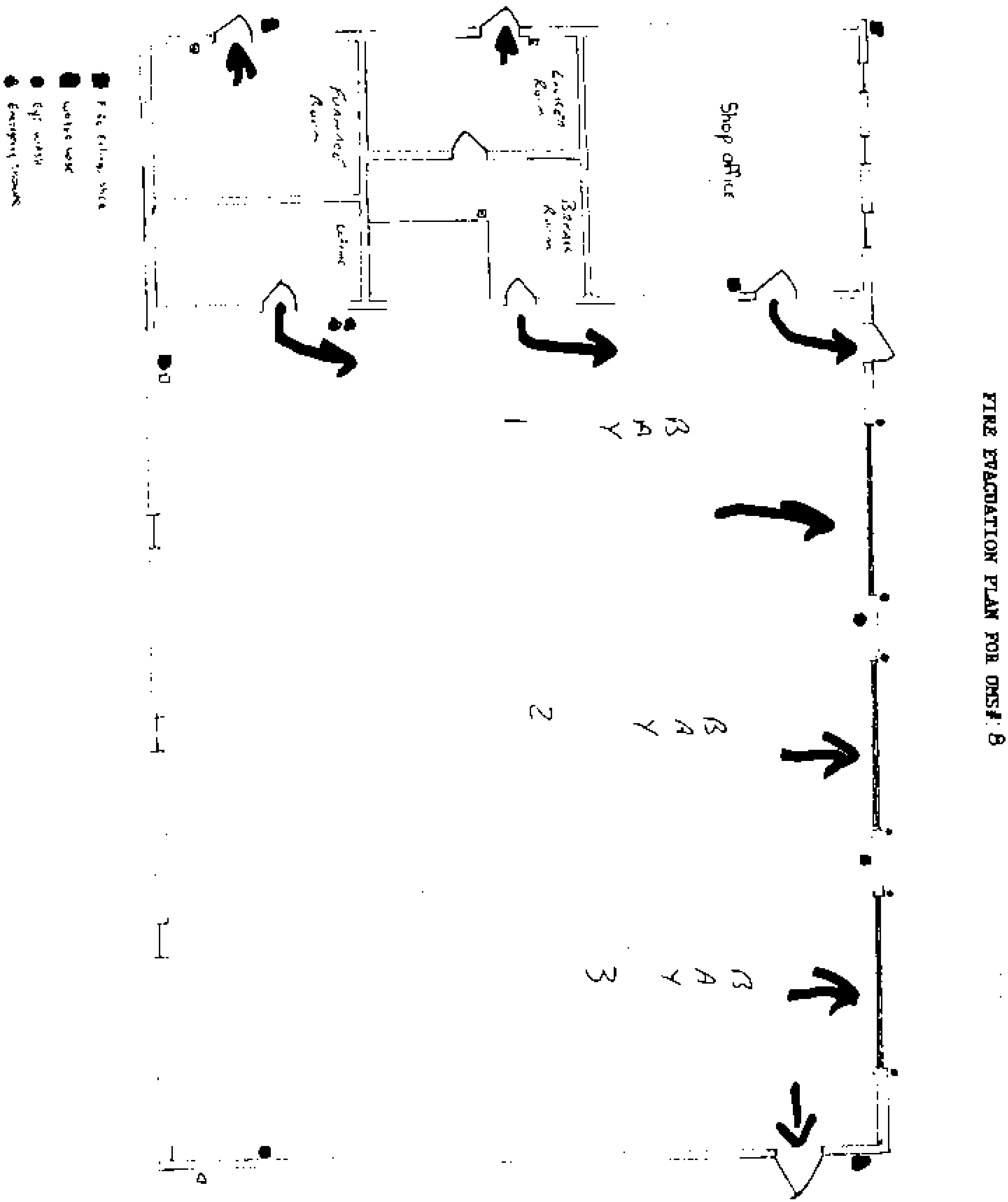
FIRE EVACUATION PLAN FOR OMS# 8
Shop office
BAY
BAY 2
BAY 3

Industrial Hygiene Study

National Guard Facility
Pikesville Readiness Center
610 Reistertown Road
Pikesville, Maryland
21208-5197

Prepared for:

National Guard Bureau Region North IH Office
301-IH Old Bay Lane
Havre de Grace, Maryland
21078

Prepared by:

The EI Group, Inc.
2101 Gateway Centre Blvd.
Morrisville, North Carolina
27560

Report Date: December 30, 2008

Project ID: IHMO080101.03

Non-Responsive [redacted] CIH
Manager, Charlotte Operations

Non-Responsive [redacted]
Senior Industrial Hygienist

TABLE OF CONTENTS

List of Appendices

EXECUTIVE SUMMARY

An industrial hygiene survey was conducted July 30, 2008 at the Readiness Center Facility located in Pikesville, Maryland. The study was performed by Mr. [redacted] CIH.

Employees were not performing tasks that provided excessive noise levels, as such; noise exposure monitoring was not conducted.

Lighting within the facility was also evaluated. Lighting was found to be within applicable recommended levels.

Various surfaces within the HVAC system and throughout the facility were screened for lead. The screening was completed using surface/wipe and air samples. None of the air samples collected were found to have detectable levels of the respective lead contaminant. Lead contamination was identified in the old indoor firing range and 3rd floor locker room.

Indoor air quality parameters were also evaluated during the assessment. Indoor air quality was found to be within those parameters established by the Environmental Protection Agency (EPA) and American Society of Heating, Refrigerating, and Air-conditioning Engineers, Inc. (ASHRAE). The firing range is inactive but could have contributed to lead exposure to building occupants. If not addressed, these may provide sources of poor indoor air quality.

During the assessment, written programs for Health and Safety, NESHAP Operations and Maintenance Asbestos Survey, and the Hazard Communication Program were requested for review, however, the onsite personnel was not able to locate the documents.

Operation Description

The Pikesville Readiness Center primarily serves as an office setting and equipment storage facility. The facility consists of a three story response center that contains a converted maintenance bay, office spaces, decommissioned gun range, and unit storage areas. Additionally, the site also contains several exterior storage and administrative buildings.

The exterior walls of the building were constructed of an EIFS/Stucco or stone. The interior walls were composed of a combination of concrete block, stone and plaster. The roof of the facility consisted of a pitched shingle roof system. The heating, ventilating, and air conditioning system (HVAC) consisted of window unit air conditioning and gas-fired boiler with unit radiators. The floors were composed of a poured concrete slab and in 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.

Site personnel at the time of the site assessment consisted of four 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 an unoccupied room 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 Wipe™ samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 µm MCE cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, MD for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix B.

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Lead Testing Results Summary

Location	Air ug/m^3	Surface ug/ft^2	Bulk	Chip %Pb
L1: Kitchen Cooler Top		**200**		
L1A: Kitchen Food Prep Table		15		
L2: 104 Window Sill		53		
L3: 101 Floor		15		
L4: 124 Bench		**1500**		
L5: 206B Desk		8.8		
L6: 208 Locker Top		28		
L7: Hall at 212		190		
L8: Range Heater		**3,300**		
L9: 300 @ 309 Floor		46		
L10 Blank		<12		
P1: Stairwell @ 100				**0.63**
P2: Room 101				0.28
P3: Room 209 Window				0.059
P4: Stairwell				0.09
P5: 208 Window				0.024
P7: Boiler Room				0.4
P8: 3rd Floor Latrine				0.01
P9: Room 124				0.19
1: Old Range	<2.5			
2: 2nd Hall/209	<2.9			
3: Blank	<3			
Criteria	**50**	**200**	**5,000**	**0.5**

Key: ND – None Detected
PB – Lead

Detectable levels of lead were identified throughout the facility, specifically in the former indoor firing range heater, classrooms and locker room. The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying contaminated surfaces. In

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the" Derivation of Wipe Surface Screening Levels for Environmental Chemicals", the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, HUD levels of 40 µg/ft^2 on floors and 250 µg/ft^2 on windowsills should be observed. No detectable levels of lead were identified in those air samples collected. Currently, OSHA observed an 8-hour time weighted average of 50 ug/m^3. Deteriorated paint was observed throughout the facility. Delaminated paint was mostly due to age along with prolonged exposure to elevated humidity levels. Lead-based paint chips were identified in stairwell adjacent to Room 105.

Lighting

A lighting assessment was conducted throughout the facility. The survey was conducted with large bay doors closed. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. 98047EL). The light meter was last calibrated on February 22, 2008. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
124: Class	7-51	30-50	Yes
124A: Class	12-53	30-50	Yes
131B: Office	83-97	30-50	Yes
131C: CPU Room/Class	64-92	30-50	Yes
120: Kitchen	73-109	50	Yes
120B: Hallway	37-41	5	Yes
112: Canteen	38-46	10	Yes
110: State Supply Storage	21-63	30	Yes
109: Latrine	18-27	5	Yes
107: Latrine	15-31	5	Yes
100: Drill Floor	48-63	30-50	Yes
104: Class	78-90	30-50	Yes
103: Class	83-118	30-50	Yes
211/212: Offices	38-46	30-50	Yes
200: Hall	3-31	5	Yes
208: Offices	52-71	30-50	Yes
206: Offices	67-73	30-50	Yes
205: Office	2-13	30-50	Yes
309: Locker Room/Latrine	25-62	7	Yes
300: Hall	18-37	5	Yes
302-307: Storage	16-42	30	Yes
101: Class	62-87	30-50	Yes
102: Class	55-73	30-50	Yes

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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 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 55-2004). 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 70.7 to 87.4°F with relative humidity readings ranging from 36.6% to 67.9%. During the survey, CO_2 levels ranged from 427 ppm to 678 ppm within the facility compared to an outdoor CO_2 level of 397 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,097 ppm (397 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)
104	81.5	**63.9**	678	0
103	81.5	**64.1**	741	0
211/212	**87.4**	58.7	550	0
2nd floor hall	**83.3**	**67.3**	576	0
208	78.8	36.6	592	0
206	81.5	45.8	628	0
205	**83.3**	58.7	618	0
309 Latrine	82.9	**61.3**	468	0
124	81.5	58.4	506	0
131B	73.4	**63.2**	533	0
131C	70.7	**61.6**	510	0
120 Kitchen	80.6	**66.3**	460	0
120B	80.9	**66.3**	458	0
112	80.6	**67.9**	427	0
110	81.5	**63.7**	496	0
Outdoors	84.3	75,2	397	0
Criteria	**73.0-79.0**	**30-50**	**<1,097**	**<9.0**

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Humidity was found to exceed guidelines in a majority of the facility. Humidity levels should be maintained below 60%.

Additionally, temperature ranges were found to be within recommended ranges with the exception of Room 205, 2^{nd} floor hallway and Room 211. These areas were found to exceed 83 °F.

A visual inspection was conducted throughout visually accessible portions of the facility. The visual inspected was conducted to assess sources or pathways of IAQ. The visual inspection revealed the following items that may be potential sources of poor IAQ:

- Significant damage to plaster adjacent to windows throughout the facility. Many windows were found to contain broken or cracked panes of glass or damaged window glazing leading to water intrusion.
- Water damaged plaster was identified in the lower level restrooms (107 and 109) which appeared to have been caused by previous water loss/flooding within the restrooms.
- Roof leaks were identified in Rooms 101, 208D, 110C and 131. At the time of the assessment, building finish materials were dry.
- Fungal growth was identified in Room 201 (Telephone closet). Fungal growth appears to be due to prolonged periods of elevated humidity.
- Room 102 was found to have a significant infestation of bees.
- Room 206 showed evidence of a rodent infestation.

Air quality samples were collected from Rooms 101, 201, 208 as well as outdoors (as control). Indoor fungal spore levels ranged from 468 to 3,060 spores/m^3. The concentration observed outdoors was found to be 4,570 spores/m^3. The highest indoor concentration was identified in room 201. Room 201 contains visible fungal growth. Based on a review of the analytical data, no airborne amplification of fungal spores was present despite the presence of visible fungal growth located in Room 201.

Location	Concentration	Predominant Genera
101	1,870 sp/m^3	Basidiospores
201	3,060 sp/m^3	*Cladosporium*
208	468 sp/m^3	Basidiospores
Outdoors	4,570 sp/m^3	Basidiospores

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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 and well as pre-formed TSI with mudded elbows.

Maintenance Bay

The area formerly utilized as a maintenance bay is currently used for storage. Maintenance activities are no longer performed.

Ventilation System Assessment

The facility was found to 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.

A local exhaust ventilation system was identified in Room 124A. The system is no longer in use as the space is no longer utilized as a maintenance garage. The LEV system was found to contain two flex duct attachments with 6” duct. Flow rate measurements ranged from 200 cfm to 209 cfm for branch A and 374 cfm to 380 cfm for branch B. Branch A was found to have a crimped section where the flex line joins the main trunk line. The LEV system was not found to operate within the recommended parameters of the American Conference of Governmental Industrial Hygienist (ACGIH) Industrial Ventilation Manual: A Manual of Recommended Practice. The ACGIH recommends a total flow rate of 1,480 to 2,200 cubic feet per minute (CFM).

Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicated within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and The EI Group, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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References

Title 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration.

Lead - (29 CFR 1910.1025(h))

American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2008 Edition

Industrial Ventilation: A Manual of Recommended Practice for Design, 25th Edition

Georgia Army National Guard: Standard Army Safety and Occupational Health Inspection Checklist; 1 October 1999 Edition

ANSI Z358.1 – 2004, Emergency Eye Wash and Shower Equipment

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007.

RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

National Emission Standard Hazardous Air Pollutants (NESHAP) - The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

Environmental Protection Agency (EPA) standards (40 Code of Federal Regulations (CFR) 745.227(h)(3))

Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation

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Appendix A

Photographs

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Thermal system insulation located adjacent to Room 103

Room 212: Old Firing Range

Wall mounted heater located in 212. Elevated levels of surface lead on heater blades.

Plaster damage to ceiling. Room 208D

Evidence of rodent infestation: Room 206

View of 3rd floor locker room

Air conditioning condensate draining into garbage can: Room 124

Possible PCB-containing ballasts maintained in Room 124

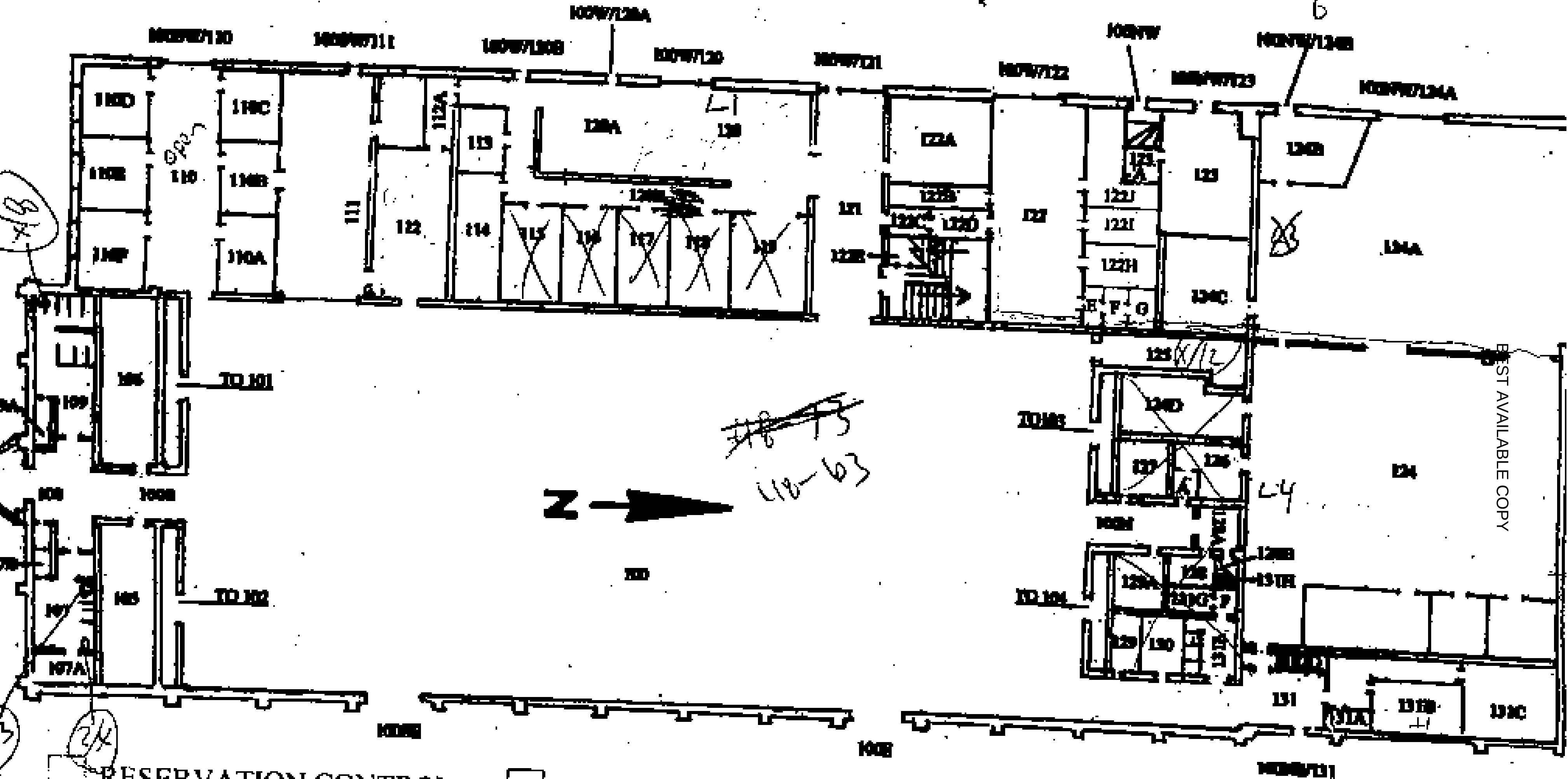
View of bees located in Room 102. Active hive present.

Water damaged plaster in Room 107

Microbial growth located in Room 201

Building exterior

MG JOHN PURLEY (OPER, JR. BUILDING
PIKESVILLE ARMORY
FIRST FLOOR PLAN
NOT TO SCALE



RESERVATION CONTROL

STATE SUPPLY CONTROL

HHB/2-110TH FA CONTROL

HHC/58TH BDE CONTROL

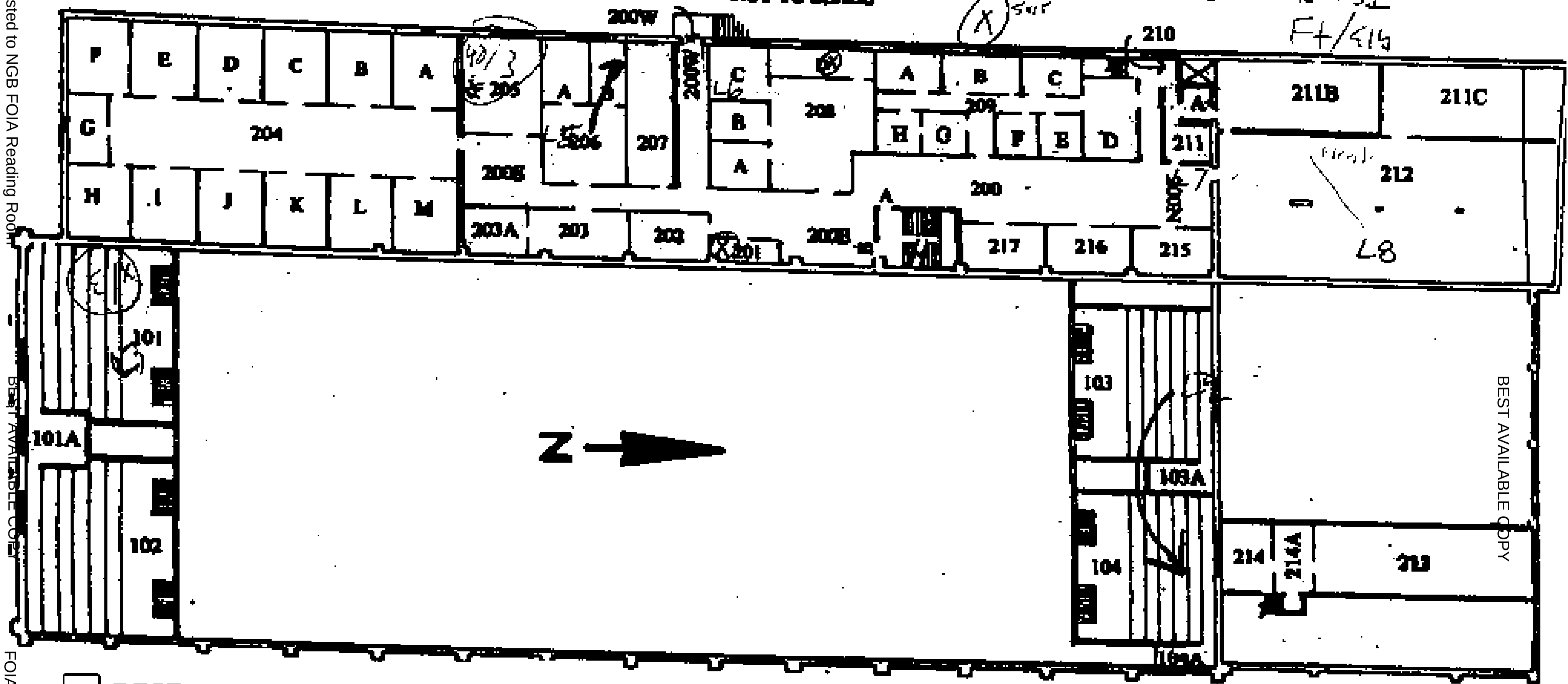
COMMON/UNASIGNED AREAS

C/129TH SIGNAL CONTROL

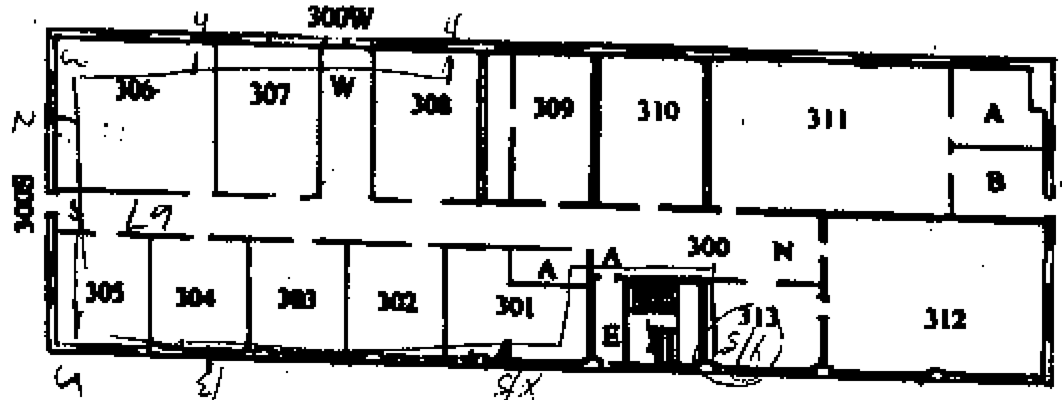
DISTANCE EDUCATION CENTER

BEST AVAILABLE COPY

MG JOHN PURLEY COOPER, JR. BUILDING
PIKESVILLE ARMORY
SECOND AND THIRD FLOOR PLAN
NOT TO SCALE



SECOND FLOOR



THIRD FLOOR

- RESERVATION CONTROL
- G/729TH BSB
- C/129TH SIGNAL CONTROL
- COMMON/UNASIGNED AREAS
- HHC/58TH BDE CONTROL
- HHB 2-110TH FA CONTROL

RR
L 341-62

Appendix B

Laboratory Analysis Report

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

ACCREDITED LABORATORY AIHA Environmental Microbiology See aihaiqap.org for details

CERTIFICATE OF ANALYSIS

Spore Trap Analysis Report

Client:	National Guard Bureau	**Job Name:**	RC 509 Pikesville, MD	**Chain Of Custody:**	181396
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	Not Provided	**Date Analyzed:**	9/8/2008
				Report Date:	9/10/2008

AMA Sample #	0881875
Client ID	208
Analyst ID	TLW
Collection Apparatus	Allergenco
Sample Volume (L)	150
Analytical Sensitivity (sp/m³)	28
Sample Condition	Acceptable

	Raw CT.	%	sp/m³
Alternaria	1	5.9%	28
Ascospores	3	17.6%	83
Aureobasidium			
Basidiospores	4	23.5%	110
Bipolaris/Drechslera/Helm.			
Boletus			
Botrytis			
Cercospora			
Chaetomium			
Cladosporium			
Coprinus			
Curvularia			
Epicoccum			
Fusarium			
Ganoderma			
Nigrospora			
Penicillium / Aspergillus	3	17.6%	83
Pithomyces			
Rusts			
Smuts/Periconia/Myxomycetes	1	5.9%	28
Stachybotrys			
Stemphylium			
Trichoderma			
Torula			
Ulocladium			
Zygomycetes			
Other Colorless	4	23.5%	110
Unknown	1	5.9%	28
Hyphal Fragments*			
Totals Spore Concentration			468

Location

Comments

No location given.

AMA Sample #	0881876
Client ID	201
Analyst ID	TLW
Collection Apparatus	Allergenco
Sample Volume (L)	150
Analytical Sensitivity (sp/m³)	28
Sample Condition	Acceptable

	Raw CT.	%	sp/m³
Alternaria			
Ascospores	6	5.4%	165
Aureobasidium			
Basidiospores	42	37.8%	1,160
Bipolaris/Drechslera/Helm.	Present		< 28
Boletus			
Botrytis			
Cercospora			
Chaetomium	Present		< 28
Cladosporium	44	39.6%	1,210
Coprinus			
Curvularia			
Epicoccum			
Fusarium	1	0.9%	28
Ganoderma			
Nigrospora	Present		< 28
Penicillium / Aspergillus	13	11.7%	358
Pithomyces			
Rusts			
Smuts/Periconia/Myxomycetes	1	0.9%	28
Stachybotrys			
Stemphylium			
Trichoderma			
Torula			
Ulocladium			
Zygomycetes			
Other Colorless	1	0.9%	28
Unknown	2	1.8%	55
Hyphal Fragments*	1		28
Arthrinium	Present		< 28
Memnoniella	1	0.9%	28
Totals Spore Concentration			3,060

Location

Comments

No location given.

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ACCREDITED LABORATORY AIHA Environmental Microbiology See aihalap.org for details

CERTIFICATE OF ANALYSIS

Spore Trap Analysis Report

Client:	National Guard Bureau	**Job Name:**	RC 509 Pikesville, MD	**Chain Of Custody:**	181396
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	Not Provided	**Date Analyzed:**	9/8/2008
				Report Date:	9/10/2008

AMA Sample #	0881877	**AMA Sample #**	0881878
Client ID	OT	**Client ID**	101
Analyst ID	TLW	**Analyst ID**	TLW
Collection Apparatus	Allergenco	**Collection Apparatus**	Allergenco
Sample Volume (L)	150	**Sample Volume (L)**	150
Analytical Sensitivity (sp/m³)	28	**Analytical Sensitivity (sp/m³)**	28
Sample Condition	Acceptable	**Sample Condition**	Acceptable

	Raw CT.	%	sp/m³	Raw CT.	%	sp/m³
Alternaria	3	1.8%	83			
Ascospores	24	14.5%	661	6	8.8%	165
Aureobasidium						
Basidiospores	64	38.6%	1,760	48	70.6%	1,320
Bipolaris/Drechslera/Helm.						
Boletus						
Botrytis						
Cercospora	1	0.6%	28			
Chaetomium						
Cladosporium	53	31.9%	1,460	6	8.8%	165
Coprinus						
Curvularia						
Epicoccum						
Fusarium				Present		< 28
Ganoderma						
Nigrospora				1	1.5%	28
Penicillium / Aspergillus	14	8.4%	386	4	5.9%	110
Pithomyces	Present		< 28			
Rusts						
Smuts/Periconia/Myxomycetes	4	2.4%	110	2	2.9%	55
Stachybotrys						
Stemphylium						
Trichoderma						
Torula						
Ulocladium						
Zygomycetes						
Other Colorless	2	1.2%	55			
Unknown	1	0.6%	28	1	1.5%	28
Hyphal Fragments*	1		28			
Totals Spore Concentration			4,570			1,870

Location (0881877)

Comments

No location given.

Location (0881878) No location given.

Comments

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

ACCREDITED LABORATORY AIHA Environmental Microbiology See aihaiqap.org for details

CERTIFICATE OF ANALYSIS

Spore Trap Analysis Report

Client:	National Guard Bureau	**Job Name:**	RC 509 Pikesville, MD	**Chain Of Custody:**	181396
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	Not Provided	**Date Analyzed:**	9/8/2008
				Report Date:	9/10/2008

General Comments, Disclaimers, and Footnotes

Analytical Method: **Sample are analyzed following the instructions and guidelines outlined in AMA Analytical Services, Inc. SOP 901.**

Sample Condition: **Acceptable: The sample was collected and delivered to the our location without disturbing the material on the sampling media.**

Unacceptable: 1. The sample is overloaded with material. 2. The sample trace has been disturbed. 3. The sample was not collected properly.

Obscured: The loading on the sample is high, possibly obscuring spores present. The quantity reported should be considered the minimum concentration present. The actual concentration may be higher than the reported concentration.

Spore Notes: **Based on their small size and very few distinguishing characteristics, Aspergillus and Penicillium cannot be differentiated by non-viable sampling methods. There are other types of spores whose morphology is similar to Aspergillus and Penicillium and cannot be differentiated by non-viable sampling methods. Examples of these similar spores are Acremonium, Paecilomyces, Wallemia, and Trichoderma.**

Smut, Periconia and Myxomycetes are three different types of organisms that have similar morphological characteristics.

Bipolaris/Dreschlera/Helm: Bipolaris / Dreschlera / Helminthosporium group.

Other Colorless represents all colorless spores that are non-distinctive and unidentifiable.

* **Hyphal Fragments: A portion of the mycelium that becomes separated from the remainder of the thallus (vegetative body), each of which has the capacity to grow and form new individuals. Results for hyphal fragments are in fragments/m³ and are not incorporated in the total spore concentration.**

Quantification: **Analytical Sensitivity (A.S.): This is dependent on the volume of air collected and the amount of the trace that was analyzed.**

The value of "Present" indicated in the Raw Count column represents the presence of this spore type during the preliminary exam at 400x. The Raw Count converts to a whole number if the spore type is encountered again during the 1,000x enumeration. The sp/m³concentration will be reported as less than the analytical sensitivity if "Present" is reported in the Raw Count.

Due to rounding, totals may not equal 100%

sp/m³: Spores per cubic meter.

Results are reported to 3 significant figures.

Tristan Ward

Analyst Tristan Ward

AMA Analytical Services, Inc.

Invoice: **95229**

Client:	National Guard Bureau	**Job Name:**	RC 509 Pikesville, MD	**Chain Of Custody:**	181396
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI	**Job Location:**	Not Provided	**Date Submitted:**	10/1/2008
	State Military Reservation	**Job Number:**	Not Provided	**Date Analyzed:**	10/8/2008
	Havre de Grace, Maryland	**P.O. Number:**	Not Provided	**Date Invoiced:**	10/8/2008
	21078			**Person Submitting:**	[redacted]

Attention: [redacted]

Page 1 of 2

AMA Sample #	Client Sample #	Analysis and Sample Type	Turn Around	Cost	Additional Analysis and Sample Type *	Turn Around *	Additional Cost *	Total Cost
0881872	1	AA Lead Air	5 Day +	$8.00				$8.00
0881873	2	AA Lead Air	5 Day +	$8.00				$8.00
0881874	3	AA Lead Air	5 Day +	$8.00				$8.00
0881879	P1	AA Lead Paint	5 Day +	$9.00				$9.00
0881880	P2	AA Lead Paint	5 Day +	$9.00				$9.00
0881881	P3	AA Lead Paint	5 Day +	$9.00				$9.00
0881882	P4	AA Lead Paint	5 Day +	$9.00				$9.00
0881883	P5	AA Lead Paint	5 Day +	$9.00				$9.00
0881885	P7	AA Lead Paint	5 Day +	$9.00				$9.00
0881886	P8	AA Lead Paint	5 Day +	$9.00				$9.00
0881887	P9	AA Lead Paint	5 Day +	$9.00				$9.00
0881888	L1	AA Lead Wipe	5 Day +	$8.00				$8.00
0881889	L1A	AA Lead Wipe	5 Day +	$8.00				$8.00
0881890	L2	AA Lead Wipe	5 Day +	$8.00				$8.00
0881891	L3	AA Lead Wipe	5 Day +	$8.00				$8.00
0881892	L4	AA Lead Wipe	5 Day +	$8.00				$8.00
0881893	L5	AA Lead Wipe	5 Day +	$8.00				$8.00
0881894	L6	AA Lead Wipe	5 Day +	$8.00				$8.00
0881895	L7	AA Lead Wipe	5 Day +	$8.00				$8.00
0881896	L8	AA Lead Wipe	5 Day +	$8.00				$8.00
0881897	L9	AA Lead Wipe	5 Day +	$8.00				$8.00
0881898	L10	AA Lead Wipe	5 Day +	$8.00				$8.00
0881875	208	MLD Spore Trap	5 Day +	$40.00				$40.00
0881876	201	MLD Spore Trap	5 Day +	$40.00				$40.00
0881877	OT	MLD Spore Trap	5 Day +	$40.00				$40.00
0881878	101	MLD Spore Trap	5 Day +	$40.00				$40.00

Note: Payment Due Upon Receipt.

Note: All Accounts over 30 days are subject to a 1½% per month service charge.

* Only apply if additional analysis was performed on the sample(s)

Account Code: NATLG

Remit to: P.O. Box 646, Hanover, Maryland 21076, 410-684-3327

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AMA Analytical Services, Inc.

Invoice: **95229**

Client:	National Guard Bureau	**Job Name:**	RC 509 Pikesville, MD	**Chain Of Custody:**	181396
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI	**Job Location:**	Not Provided	**Date Submitted:**	10/1/2008
	State Military Reservation	**Job Number:**	Not Provided	**Date Analyzed:**	10/8/2008
	Havre de Grace, Maryland	**P.O. Number:**	Not Provided	**Date Invoiced:**	10/8/2008
	21078			**Person Submitting:**	[redacted]

Attention: [redacted]

AMA Sample #	Client Sample #	Analysis and Sample Type	Turn Around	Cost	Additional Analysis and Sample Type *	Turn Around *	Additional Cost *	Total Cost

Sub-Total:	**$344.00**
Additional Charge:	**$0.00**
Total:	**$344.00**

Note: Payment Due Upon Receipt.

Note: All Accounts over 30 days are subject to a 1½% per month service charge.

* Only apply if additional analysis was performed on the sample(s)

Account Code: NATLG

Remit to: P.O. Box 646, Hanover, Maryland 21076, 410-684-3327

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCREDITED LABORATORY AIHA Environmental Lead See aihaiqap.org for details

100470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	RC 509 Pikesville, MD	**Chain Of Custody:**	181396
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	9/8/2008

Report Date: 9/8/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Final Result	Comments
0881872	1	Flame	Air	1210	N/A	2.48 ug/m^3	< 2.5 ug/m^3	
0881873	2	Flame	Air	1026	N/A	2.92 ug/m^3	< 2.9 ug/m^3	
0881874	3	Flame	Air Blank	0	N/A	3.00 ug/m^3	< 3 ug	
0881879	P1	Flame	Paint Chip	****	N/A	0.01 %Pb	0.63 %Pb	
0881880	P2	Flame	Paint Chip	****	N/A	0.01 %Pb	0.28 %Pb	
0881881	P3	Flame	Paint Chip	****	N/A	0.01 %Pb	0.059 %Pb	
0881882	P4	Flame	Paint Chip	****	N/A	0.01 %Pb	0.09 %Pb	
0881883	P5	Flame	Paint Chip	****	N/A	0.01 %Pb	0.024 %Pb	
0881885	P7	Flame	Paint Chip	****	N/A	0.01 %Pb	0.4 %Pb	
0881886	P8	Flame	Paint Chip	****	N/A	0.01 %Pb	< 0.01 %Pb	
0881887	P9	Flame	Paint Chip	****	N/A	0.01 %Pb	0.19 %Pb	
0881888	L1	Flame	Wipe	****	1.563	7.68 ug/ft^2	200 ug/ft^2	
0881889	L1A	Flame	Wipe	****	0.778	15.43 ug/ft^2	< 15 ug/ft^2	
0881890	L2	Flame	Wipe	****	1.945	6.17 ug/ft^2	53 ug/ft^2	
0881891	L3	Flame	Wipe	****	1.000	12.00 ug/ft^2	15 ug/ft^2	
0881892	L4	Flame	Wipe	****	1.000	12.00 ug/ft^2	1500 ug/ft^2	
0881893	L5	Flame	Wipe	****	1.361	8.82 ug/ft^2	< 8.8 ug/ft^2	
0881894	L6	Flame	Wipe	****	1.000	12.00 ug/ft^2	28 ug/ft^2	
0881895	L7	Flame	Wipe	****	1.000	12.00 ug/ft^2	190 ug/ft^2	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA Environmental Lead 100470
NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	RC 509 Pikesville, MD	**Chain Of Custody:**	181396
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	9/8/2008 **Report Date:** 9/8/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Final Result	Comments
0881896	L8	Flame	Wipe	****	1.333	9.00 ug/ft²	3300 ug/ft²	
0881897	L9	Flame	Wipe	****	1.287	9.33 ug/ft²	46 ug/ft²	
0881898	L10	Flame	Wipe Blank	****	N/A	12.00 ug	< 12 ug	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these sampes
NY ELAP accrediation applies only to paint chip, wipe, and water samples.

Analyst: Melissa Sampson

Technical Manager: G Edward Carney

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 16543

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	9/8/2008

		Result		Percent Recovery	RPD	Comment
Preparation Blank		-0.113	ppm			Acceptable
Report Limit Verification Sample		0.2343	ppm	70.3%		Outside Limits
Expected Spike Level (ppm)	0.3333					
Duplicate Sample 1		#Num!	mg/Kg			
Duplicate Sample 2		#Num!	mg/Kg		#Error	#Error
Matrix Spike Analysis						
Spiked Sample				99.69%		Acceptable
Spike Duplicate						Acceptable
Laboratory Control Sample 1		330.278	µg	102.38%		Acceptable
Laboratory Control Sample 2		294.439	µg	100.89%	1.47%	Acceptable

Calibration Information

Correlation of Calibration Curve 0.999768

All calibration verification samples are within acceptance limits.

Notes: Recovery for the Report Limit Verification Sample was 70.3%, below the lower control limit of 80%. A passing Report Limit Verification sample for wipe samples for this analysis date can be found with SDG 16546 (119.02% recovery).

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181396	81888	L1
181396	81889	L1A

SDG Number: 16543

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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181396	81890	L2
181396	81891	L3
181396	81892	L4
181396	81893	L5
181396	81894	L6
181396	81895	L7
181396	81896	L8
181396	81897	L9
181396	81898	L10
181399	81931	9
181399	81932	10
181399	81933	11
181399	81934	12
181399	81935	13
181399	81936	14
181399	81937	15

SDG Number: 16543

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AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 16545

Analysis Type	Flame
Sample Type:	Paint Chip
Analysis Date:	9/8/2008

		Result		Percent Recovery	RPD	Comment
Preparation Blank		-0.031	ppm			Acceptable
Report Limit Verification Sample		0.3415	ppm	102.5%		Acceptable
Expected Spike Level (ppm)	0.3333					
Duplicate Sample 1		2791	mg/Kg			
Duplicate Sample 2		2866	mg/Kg		2.64%	Acceptable
Matrix Spike Analysis						
Spiked Sample				90.15%		Acceptable
Spike Duplicate				107.33%	17.40%	Acceptable
Laboratory Control Sample 1		212.150	µg	95.65%		Acceptable
Laboratory Control Sample 2		254.206	µg	97.63%	2.05%	Acceptable

Calibration Information

Correlation of Calibration Curve 0.999835

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
181396	81879	P1
181396	81880	P2

SDG Number: 16545

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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181396	81881	P3
181396	81882	P4
181396	81883	P5
181396	81885	P7
181396	81886	P8
181396	81887	P9
503170	81977	90408-LBP1-TJD
503170	81978	90408-LBP2-TJD
503170	81979	90408-LBP3-TJD
503170	81980	90408-LBP4-TJD
503170	81981	90408-LBP5-TJD
166695	82030	GT08090508
166695	82031	GT08090509
182855	82032	LM 01-Blue
182855	82033	LM 02-Green

SDG Number: 16545

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 16542

Analysis Type:	Flame
Sample Type:	Air
Analysis Date	9/8/2008

	Result		Percent Recovery	RPD	Comment
Preparation Blank	0.010	ppm			Acceptable
Report Limit Verification Sample	0.2686	ppm	107.4%		Acceptable
Expected Spike Level (ppm) 0.25					
Duplicate Sample 1	#Num!	mg/Kg			
Duplicate Sample 2	#Num!	mg/Kg		#Error	#Error
Matrix Spike Analysis					
Spiked Sample			102.73%		Acceptable
Spike Duplicate			99.56%	3.14%	Acceptable
Laboratory Control Sample 1	133.956	µg	103.29%		Acceptable
Laboratory Control Sample 2	120.145	µg	100.16%	3.07%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999875

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
182853	81732	84081
182853	81734	84083

SDG Number: 16542

BEST AVAILABLE COPY

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
182853	81738	84087
182853	81739	84088
503162	81781	OLN-LA-01
503162	81782	OLN-LA-FB1
503158	81797	HLN-LA-01
503158	81798	HLN-LA-FB1
503165	81852	JLN-LA-01
503165	81853	JTN-LA-FB1
181396	81872	1
181396	81873	2
181396	81874	3
181398	81913	516-1
181398	81914	516-2
181398	81915	516-3
181399	81923	500-1
181399	81924	500-2
181399	81925	500-3

SDG Number: 16542

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

ACCREDITED LABORATORY AIHA Environmental Microbiology See aihaqap.org for details

CERTIFICATE OF ANALYSIS

Spore Trap Analysis Report

Client:	National Guard Bureau	**Job Name:**	RC 509 Pikesville, MD	**Chain Of Custody:**	181396
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	Not Provided	**Date Analyzed:**	9/8/2008
				Report Date:	9/10/2008

AMA Sample #	0881875
Client ID	208
Analyst ID	TLW
Collection Apparatus	Allergenco
Sample Volume (L)	150
Analytical Sensitivity (sp/m³)	28
Sample Condition	Acceptable

	Raw CT.	%		sp/m³
Alternaria	1	5.9%		28
Ascospores	3	17.6%		83
Aureobasidium				
Basidiospores	4	23.5%		110
Bipolaris/Drechslera/Helm.				
Boletus				
Botrytis				
Cercospora				
Chaetomium				
Cladosporium				
Coprinus				
Curvularia				
Epicoccum				
Fusarium				
Ganoderma				
Nigrospora				
Penicillium / Aspergillus	3	17.6%		83
Pithomyces				
Rusts				
Smuts/Periconia/Myxomycetes	1	5.9%		28
Stachybotrys				
Stemphylium				
Trichoderma				
Torula				
Ulocladium				
Zygomycetes				
Other Colorless	4	23.5%		110
Unknown	1	5.9%		28
Hyphal Fragments*				
Totals Spore Concentration				468

Location

Comments

No location given.

AMA Sample #	0881876
Client ID	201
Analyst ID	TLW
Collection Apparatus	Allergenco
Sample Volume (L)	150
Analytical Sensitivity (sp/m³)	28
Sample Condition	Acceptable

	Raw CT.	%		sp/m³
Alternaria				
Ascospores	6	5.4%		165
Aureobasidium				
Basidiospores	42	37.8%		1,160
Bipolaris/Drechslera/Helm.	Present		<	28
Boletus				
Botrytis				
Cercospora				
Chaetomium	Present		<	28
Cladosporium	44	39.6%		1,210
Coprinus				
Curvularia				
Epicoccum				
Fusarium	1	0.9%		28
Ganoderma				
Nigrospora	Present		<	28
Penicillium / Aspergillus	13	11.7%		358
Pithomyces				
Rusts				
Smuts/Periconia/Myxomycetes	1	0.9%		28
Stachybotrys				
Stemphylium				
Trichoderma				
Torula				
Ulocladium				
Zygomycetes				
Other Colorless	1	0.9%		28
Unknown	2	1.8%		55
Hyphal Fragments*	1			28
Arthrinium	Present		<	28
Memnoniella	1	0.9%		28
Totals Spore Concentration				3,060

Location

Comments

No location given.

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A Specialized Environmental Laboratory

ACCREDITED LABORATORY AIHA Environmental Microbiology See aihaiqap.org for details

CERTIFICATE OF ANALYSIS
Spore Trap Analysis Report

Client:	National Guard Bureau	**Job Name:**	RC 509 Pikesville, MD	**Chain Of Custody:**	181396
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	Not Provided	**Date Analyzed:**	9/8/2008
				Report Date:	9/10/2008

AMA Sample #	0881877	**AMA Sample #**	0881878
Client ID	OT	**Client ID**	101
Analyst ID	TLW	**Analyst ID**	TLW
Collection Apparatus	Allergenco	**Collection Apparatus**	Allergenco
Sample Volume (L)	150	**Sample Volume (L)**	150
Analytical Sensitivity (sp/m³)	28	**Analytical Sensitivity (sp/m³)**	28
Sample Condition	Acceptable	**Sample Condition**	Acceptable

	Raw CT.	%	sp/m³	Raw CT.	%	sp/m³
Alternaria	3	1.8%	83			
Ascospores	24	14.5%	661	6	8.8%	165
Aureobasidium						
Basidiospores	64	38.6%	1,760	48	70.6%	1,320
Bipolaris/Drechslera/Helm.						
Boletus						
Botrytis						
Cercospora	1	0.6%	28			
Chaetomium						
Cladosporium	53	31.9%	1,460	6	8.8%	165
Coprinus						
Curvularia						
Epicoccum						
Fusarium				Present		< 28
Ganoderma						
Nigrospora				1	1.5%	28
Penicillium / Aspergillus	14	8.4%	386	4	5.9%	110
Pithomyces	Present		< 28			
Rusts						
Smuts/Periconia/Myxomycetes	4	2.4%	110	2	2.9%	55
Stachybotrys						
Stemphylium						
Trichoderma						
Torula						
Ulocladium						
Zygomycetes						
Other Colorless	2	1.2%	55			
Unknown	1	0.6%	28	1	1.5%	28
Hyphal Fragments*	1		28			
Totals Spore Concentration			4,570			1,870

Location		**Location**	No location given.
Comments	No location given.	**Comments**	

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CERTIFICATE OF ANALYSIS

Spore Trap Analysis Report

Client:	National Guard Bureau	**Job Name:**	RC 509 Pikesville, MD	**Chain Of Custody:**	181396
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	Not Provided	**Date Analyzed:**	9/8/2008
				Report Date:	9/10/2008

General Comments, Disclaimers, and Footnotes

Analytical Method: Sample are analyzed following the instructions and guidelines outlined in AMA Analytical Services, Inc. SOP 901.

Sample Condition: Acceptable: The sample was collected and delivered to the our location without disturbing the material on the sampling media.

Unacceptable: 1. The sample is overloaded with material. 2. The sample trace has been disturbed. 3. The sample was not collected properly.

Obscured: The loading on the sample is high, possibly obscuring spores present. The quantity reported should be considered the minimum concentration present. The actual concentration may be higher than the reported concentration.

Spore Notes: Based on their small size and very few distinguishing characteristics, Aspergillus and Penicillium cannot be differentiated by non-viable sampling methods. There are other types of spores whose morphology is similar to Aspergillus and Penicillium and cannot be differentiated by non-viable sampling methods. Examples of these similar spores are Acremonium, Paecilomyces, Wallemia, and Trichoderma.

Smut, Periconia and Myxomycetes are three different types of organisms that have similar morphological characteristics.

Bipolaris/Dreschlera/Helm: Bipolaris / Dreschlera / Helminthosporium group.

Other Colorless represents all colorless spores that are non-distinctive and unidentifiable.

* Hyphal Fragments: A portion of the mycelium that becomes separated from the remainder of the thallus (vegetative body), each of which has the capacity to grow and form new individuals. Results for hyphal fragments are in fragments/m^3 and are not incorporated in the total spore concentration.

Quantification: Analytical Sensitivity (A.S.): This is dependent on the volume of air collected and the amount of the trace that was analyzed.

The value of "Present" indicated in the Raw Count column represents the presence of this spore type during the preliminary exam at 400x. The Raw Count converts to a whole number if the spore type is encountered again during the 1,000x enumeration. The sp/m^3concentration will be reported as less than the analytical sensitivity if "Present" is reported in the Raw Count.

Due to rounding, totals may not equal 100%

sp/m^3: Spores per cubic meter.

Results are reported to 3 significant figures.

Analyst Tristan Ward

EI

SAMPLE CHAIN OF CUSTODY

DATE SHIPPED	# OF SAMPLES	SAMPLE MEDIA TYPE	PROJECT NAME
	27		Pikesville 181396

CONTACT	TELEPHONE NUMBER

SAMPLE # OR AREA		SAMPLE DATE	SAMPLE VOLUME	ANALYSIS REQUESTED
P9	(Rm 124)	7/30/08	—	Lead (Paint Chip)
L1	(Kit Cooler)		225 in²	Lead wipe
L1A	(Kit Food Prep)		112 in²	↓
L2	(104 ws)		280 in²	
L3	(101 Flr)		144 in²	
L4	(124 Bench)		144 in²	
L5	(206 B Desk)		196 in²	
L6	(208 Locker Top)		144 in²	
L7	(200/212 Flr)		144 in²	
L8	(Range Htr)		142 in²	
L9	(300 @ 305)		185.25 in²	
L10	Blank		ø	

Samples Relinquished By:	Non-Responsive [redacted]	8/10/08 Date
Samples Received By:	Signature	/ Date
Samples Analyzed By:	Signature	/ Date

Pikesville 2/

SAMPLE CHAIN OF CUSTODY

EI

DATE SHIPPED	# OF SAMPLES	SAMPLE MEDIA TYPE	PROJECT NAME
7/30/08	27		181796 NGB RC Md

CONTACT	TELEPHONE NUMBER
[redacted]	336 455 2558

SAMPLE # OR AREA	SAMPLE DATE	SAMPLE VOLUME	ANALYSIS REQUESTED
1 Range	7/30/08	1209.6 L	Lead Air
2 2nd Hall	↓	1025.6 L	↓
3 Blank	↓	Ø L	↓
208	↓	150 L	Fungal Spore
201	↓	150 L	↓
OT	↓	150 L	↓
101	↓	150 L	↓
P1 (Stair 100 NW)	↓	—	Lead (Paint Chip)
P2 (Rm 101)	↓	—	↓
P3 (Rm 209 und)	↓	—	↓
P4 (Stair)	↓	—	↓
P5 (208 und)	↓	—	↓
P6 ———	↓		↓
P7 (Boiler Rm)	↓	—	↓
P8 (3rd Latrine)	↓	—	↓

Samples Relinquished By:	[redacted]	8/10/08 Date
Samples Received By:	Signature	Date
Samples Analyzed By:	Signature	Date

Pikesville ✓

AMA Analytical Services, Inc.
Focused on Results
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 181396

Mailing/Billing Information:
1. Client Name: National Guard Bureau NE
2. Address 1: 301-1H Old Bay Lane
3. Address 2: Havre de Grace, MD 21078
4. Address 3:
5. Phone #: 336 455 2558 Fax #: 704 593 1650

Submittal Information:
1. Job Name: RC 509 Pikesville, MD
2. Job Location:
3. Job #: [redacted] P.O. #:
4. Contact Person: [redacted] 336 455 2558
5. Submitted by: Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ 3 Day ☐ Results Required By Noon ☐ Next Day ☒ 5 Day + (Every Attempt Will Be ☐ 2 Day Date Due: 09/10/08 Made to Accomodate)	☐ Include COC/Field Data Sheets with Report ☐ Email [redacted] @ e2.com ☐ Fax: ☐ Verbal:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ NIOSH 7400 ________(QTY)
☐ Fiberglass ________(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ AHERA ________(QTY)
☐ NIOSH 7402 ________(QTY)
☐ Other (specify________)________(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ________(QTY)
☐ EPA Point Count ________(QTY)
☐ NY State Friable 198.1 ________(QTY)
☐ Grav. Reduction ELAP 198.6 ________(QTY)
☐ Other (specify________)________(QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ________(QTY)
☐ NY State PLM/TEM ________(QTY)
☐ Residual Ash ________(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ________(QTY)
☐ Quan. (s/area) Vacuum D5755-95 ________(QTY)
☐ Quan. (s/area)Dust D6480-99 ________(QTY)
TEM Water
☐ Qual. (pres/abs) ________(QTY)
☐ ELAP 198.2/EPA 100.2 ________(QTY)
☐ EPA 100.1 ________(QTY)

☐ All samples received in good condition unless otherwise noted.
(TEM Water samples ______°C)

Lead Analysis
☒ Paint Chip 8 (QTY)
☒ Dust Wipe (wipe type________) 11 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid ________(QTY)
☐ TCLP ________(QTY)
☐ Drinking Water ________(QTY)
☐ Waste Water ________(QTY)
☐ Dust Wipe Furnace (wipe type________)________(QTY)

Mold - Direct Microscopic Analysis
☐ Collection Apparatus for Spore Traps:
☒ Spore-Trap 4 (QTY) ☐ Bulk ____(QTY)
☐ Surface Swab ____(QTY) ☐ Surface Vacuum Dust ____(QTY)
☐ Surface Tape ____(QTY) ☐ Other (Specify____)____(QTY)

CLIENT ID NUMBER	SAMPLE INFORMATION: SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
																	Date/Time: Contact: By:
	See Attached																Date/Time: Contact: By:
																	Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 9/4/08 @ 900 Via: UPS By (Print): M. Smith Sign:
2. Date/Time Analyzed: 9/10/08 @ By (Print): TRISTAN WARD Sign:
3. Results Reported To: V MAISTO Via: EMAIL Date: 9/10/08 Time: Initials: TW
4. Comments:

ANALYTICAL LABORATORY SERVICES, INC.
Environmental ✦ Industrial Hygiene ✦ Field Services
www.analyticallab.com

Industrial Hygiene Survey

National Guard Facility
Pikesville Military Reservation
610 Reisterstown Road
Pikesville, MD 21208

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Pikesville Military Reservation** **610 Reisterstown Road** **Pikesville, MD 21208**
Prepared By:	**Analytical Laboratory Services, Inc.** **3544 North Progress Avenue** **Suite 100** **Harrisburg, PA 17110**
Survey Date:	**July 9, 2010**
Report Date:	**August 23, 2010**
ALSI Project #:	**1007423**

Non-Responsive
[redacted]

Director, Environmental Health & Safety

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Table of Contents

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Section 1.0
Executive Summary

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted July 9, 2010, at the Pikesville Military Reservation located at 610 Reisterstown Road, Pikesville, Maryland 21208-4765. The study was performed by Mr [redacted] CIH.

1. Surface levels of lead exceeded 200 ug/ft2 in the following locations:

    a. Armory Old Firing Range – Painted Ledge
    b. Armory Old Firing Range – Light
    c. Armory – Second Floor Room 205 Bookshelf
    d. Armory – Third Floor Brown Painted Floor in Hallway

    Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2.

2. Lighting levels did not meet the minimum recommended guidelines in the following areas: 1) Drill Hall, 2) Kitchen, 3) Admin Building Training Room 4) Construction Building Work Bays. Lighting should be improved in these areas.

3. Relative humidity exceeded the recommended ceiling of 60% in one location and temperature exceeded the recommended criteria of 79 degrees F in all locations. There is no central air conditioning system in this building.

4. A visual inspection was conducted throughout accessible portions of the facility. The visual inspection was conducted to assess sources or pathways of factors potentially deleterious to IAQ.

    a. A few water damaged ceiling areas were observed. Active or current water infiltration was observed in the 3rd Floor Honor Guard Area of the Armory.

    b. All sources of water infiltration should be identified and repaired. Water damaged ceiling and building materials should be removed and replaced. Some water damaged building materials may contain asbestos and should be handled properly.

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Section 2.0
Operation Description & Observations

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Section 2.0 Operation Description & Observations

The Pikesville Military Reservation consists of three main buildings: 1) Armory 2) Administrative Building 3) Construction Shop. There are numerous smaller buildings present. Most are unoccupied and serve as storage areas or administrative areas on drill weekend or for designated occasions. The Armory and Administrative Building are primarily office settings and equipment storage facilities. There are offices, drill hall, garage, and storage areas. There are nineteen full time occupants. Other occupants are present on drill weekends or depending upon duty requirements. The Construction Section is occupied by one full time administrative person. Workers from this area travel to the various MD ARNG facilities and perform various construction and maintenance tasks.

The armory was initially constructed in 1938. It is a large three story stone building that is mostly unoccupied. There have been several renovations and additions to the building since it was first built. The drill hall is on the first floor. The second floor is vacant. The third floor is occupied by the Honor Guard in one section. The exterior of the building is stone/masonry.

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 in any of the buildings. The armory floors were composed of a poured concrete slab. Administrative areas have a suspended drop ceiling system.

There is an old firing range in the second floor of the armory building. It has been completely abated. It is empty. There is no childcare facility in this building.

Site personnel at the time of the site assessment consisted of seven administrative personnel and twelve maintenance personnel. The employees on site were conducting general administrative work or building maintenance.

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. One work station in the construction shop had the monitor lower than recommended.

Two buildings were closed and could not be surveyed. They were the NCO club and the MD Defense Building.

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Section 3.0
Noise Survey

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Section 3.0 Noise Survey

Employees were not performing tasks that provided excessive noise levels, as such: noise exposure monitoring was not conducted.

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Section 4.0
Lead Testing

Section 4.0 Lead Testing

At the time of the assessment, no activities were observed which would generate lead exposure. Soldiers reportedly clean rifles sometimes during drill weekends. The facility contains an unoccupied room which was once an indoor firing range. It is now an empty room.

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/m^3	Surface ug/ft^2	Paint Chip %Pb
1	Assembly Hall – Main Armory Classroom 1	<4.4		
2	Assembly Hall – Main Armory Drill Hall	<4.5		
3	Blank	<3		
4	Armory Old Firing Range Painted Ledge		**220**	
5	Armory Old Firing Range - Floor		<110	
6	Armory Old Firing Range - Light		**2,900**	
7	Armory Outside Old Firing Range Floor		<110	
8	Armory – Second Floor Room 209 Bookshelf		<110	
9	Armory – Second Floor Room 205 Bookshelf		**440**	
10	Armory – Third Floor Brown Painted Floor in Hallway		**1,400**	
11	Armory Honor Guard Office Break Table		<110	
12	Armory Kitchen – Food Prep Table		<110	
13	Armory – Assembly Hall Floor (Red)		170	
14	Admin. Bldg. Large Training Room – Window Sill		<110	
15	Admin. Bldg. – Front Lobby Window Sill		<110	
16	Armory – Peeling Paint in Stairwell			0.23

Sample #	Location	Air ug/m³	Surface ug/ft²	Paint Chip %Pb
17	Blank		<12	
18	Construction Shop – Break Table in Shop Area		<110	
19	Assembly Hall - Room 122A Mess Hall Table		<110	
20	Assembly Hall – Classroom 4 Floor		<110	
21	Assembly Hall – Front Entrance Window Sill		120	
Criteria		**50**	**200**	**0.5**

Key: **Bolded** results exceed listed criteria

Surface levels of lead exceeded 200 ug/ft^2 in the following locations:

1. Armory Old Firing Range – Painted Ledge
2. Armory Old Firing Range – Light
3. Armory – Second Floor Room 205 Bookshelf
4. Armory – Third Floor Brown Painted Floor in Hallway

The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for Environmental Chemicals," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 ug/m^3. In fact, no detectable level of lead was identified in the air sample collected.

Deteriorated paint was observed in a few locations throughout the facility. Overall, the painted surfaces were in good condition. Delaminated paint was mostly due to age along with prolonged exposure to elevated relative humidity levels. A paint chip sample was collected from the Armory Stairwell. 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/ft^2. Deteriorated and peeling paint should be properly remediated and repaired.

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Section 5.0
Lighting

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Section 5.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. K070003). The light meter was last calibrated on November 26, 2009. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Armory - Drill Hall	**18 – 24**	30-50	No
Armory – Kitchen	**38.3**	50	No
Armory – Second Floor Hall	37.3	5	Yes
Armory – Third Floor Honor Guard Office	102.4	30-50	Yes
Armory – Third Floor – Weight Room	159.6	30	Yes
Armory – Stairwell	97.2	5	Yes
Armory – First Floor Men's Latrine	60.4	5	Yes
Armory - Classroom 1	88.1	30-50	Yes
Admin. Building - Lobby	11.3	5	Yes
Admin. Building Office/Copier Area	90.3	30-50	Yes
Admin. Building – Office 10	49.8	30-50	Yes
Admin. Building – Large Training Room	**14.2**	30-50	No
Admin. Building – Second Floor HHS Orderly Room	88.7	30-50	Yes
Armory – Info Tech Office	89.7	30-50	Yes
Construction Office	127.0	30-50	Yes
Construction – Work Bays	**27.0**	75	No
Separate Building - Break Area	53.7	30-50	Yes

Key: **Bolded** results are less than the listed criteria

Lighting levels did not meet the minimum recommended guidelines in the following areas: 1) Drill Hall, 2) Kitchen, 3) Admin Building Training Room 4) Construction Building Work Bays. Lighting should be improved in these areas.

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Section 6.0
Indoor Air Quality

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Section 6.0 Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7565X (Serial # 0839020). The IAQ Meter was last calibrated in March 2010.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2007). ASHRAE specifies temperature and relative humidity ranges for human comfort (ASHRAE 55-2004). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60% in occupied areas.

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior ranged from 79.8 to 89.5 degrees F with relative humidity readings ranging from 29.8% to 67.3%. During the survey, carbon dioxide (CO_2) levels ranged from 383 ppm to 765 ppm within the facility compared to an outdoor CO_2 level of 388 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,088 ppm (388 ppm + 700 ppm). The results of the testing met the ASHRAE guidelines. The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Armory – Assembly Hall	87.7	61.4	383	0
Armory – Kitchen	85.7	63.0	410	0
Armory – Second Floor Hall	86.5	67.3	480	0
Armory – Third Floor Honor Guard Office	88.7	59.1	450	0
Armory – Third Floor – Weight Room	89.5	54.7	470	0
Armory – Stairwell	86.7	58.7	505	0
Armory – Classroom 1	86.8	58.6	451	0
Admin. Building – Lobby	79.8	47.5	521	0
Admin. Building – Office/Copier Area	78.9	51.9	576	0
Admin. Building – Office 10	80.2	57.0	762	0
Admin. Building – Large Training Room	81.3	54.6	521	0
Admin. Building – Second Floor HHS Orderly Room	83.9	58.7	554	0

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Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Armory – Info Tech Office	**83.7**	**61.8**	429	0
Construction Office	**79.8**	53.7	458	0
Construction – Work Bays	**81.2**	**61.7**	501	0
Outdoors	90.0	60.1	388	0
Separate Building – Break Area	**84.0**	29.8	765	-
Criteria	**73.0-79.0**	**30-60**	**<1,088**	**<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 these buildings. There are some window air conditioners present. 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. A few water damaged ceiling areas were observed. Active or current water infiltration was observed in the 3rd Floor Honor Guard Area of the Armory.

2. No areas of extensive fungal growth were observed. Areas such as above ceilings were inaccessible and could not be inspected.

All sources of water infiltration should be identified and repaired. Water damaged ceiling and building materials should be removed and replaced. Some water damaged building materials may contain asbestos and should be handled properly.

Section 7.0
Suspect Asbestos Containing Building Materials

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Section 7.0 Suspect Asbestos Containing Building Materials

Suspect asbestos containing materials (ACM) 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 only suspect ACM that had the potential to cause concern was the areas of the 3rd floor of the Armory where extensive water damage was present in the ceilings. Water leaks in these areas should be repaired. If ACM is damaged appropriate action should be taken.

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Section 8.0
Maintenance Bay

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Section 8.0 Maintenance Bay

There is a separate building that houses the Construction Section. The Construction Section is occupied by one full time administrative person. Workers from this area travel to the various MD ARNG facilities and perform various construction and maintenance tasks. Maintenance activities are no longer performed in this area. It is used primarily for storage of equipment and supplies. It was not apparent that any special clean up activity has been performed.

There are also two local exhaust ventilation (LEV) trunks present which were previously used to remove vehicle exhaust from the building. The vehicle exhaust ventilation system was inoperable at the time of this survey so no ventilation measurements could be performed. LEV used for vehicle exhaust should be repaired and utilized if vehicle maintenance activity occurs that involves operation of vehicles inside the building.

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Section 9.0
Limitations

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Section 9.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Analytical Laboratory Services, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A
Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

AIHA LAP, LLC ACCREDITED LABORATORY

LAB #100470

NY ELAP
10920

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	Job Name:	Pikesville Military Reservation	Chain Of Custody:	508279
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Pikesville, MD	Date Submitted:	7/14/2010
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	[redacted]
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	7/21/2010
				Report Date:	7/21/2010

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
1060189	1007423-1	Flame	Air	684	N/A	4.4	ug/m³	<3	<4.4	ug/m³	
1060190	1007423-2	Flame	Air	664	N/A	4.5	ug/m³	<3	<4.5	ug/m³	
1060191	1007423-3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1060192	1007423-4	Flame	Wipe	****	0.108	110	ug/ft²	24	220	ug/ft²	
1060193	1007423-5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1060194	1007423-6	Flame	Wipe	****	0.108	110	ug/ft²	310	2900	ug/ft²	
1060195	1007423-7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1060196	1007423-8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1060197	1007423-9	Flame	Wipe	****	0.108	110	ug/ft²	47	440	ug/ft²	
1060198	1007423-10	Flame	Wipe	****	0.108	110	ug/ft²	150	1400	ug/ft²	
1060199	1007423-11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1060200	1007423-12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1060201	1007423-13	Flame	Wipe	****	0.108	110	ug/ft²	18	170	ug/ft²	
1060202	1007423-14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1060203	1007423-15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1060204	1007423-16	Flame	Paint Chip	****	N/A	0.011	%Pb		0.23	%Pb	
1060205	1007423-17	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
1060206	1007423-18	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1060207	1007423-19	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

LAB #100470

NY ELAP 10920

Client:	National Guard Bureau	Job Name:	Pikesville Military Reservation	Chain Of Custody:	508279
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Pikesville, MD	Date Submitted:	7/14/2010
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	[redacted]
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	7/21/2010 Report Date: 7/21/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments
1060208	1007423-20	Flame	Wipe	****	0.108	110 ug/ft²	<12	<110 ug/ft²	
1060209	1007423-21	Flame	Wipe	****	0.108	110 ug/ft²	13	120 ug/ft²	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)

%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these samples.
NY ELAP accreditation applies only to paint chip, wipe, and soil samples.

Analyst: Nida McGarvey

Technical Manager: G Edward Carney

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