Page 1 of 2

OWI (410) 247-2024 150202 210 REV. 8.06

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 Inqui

508279

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: Pikesville Military Reservation
2. Job Location: Pikesville, MD
3. Job #: PO #: W912K6-08-A-0003
4. Contact Pers[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: 7/21/10 ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ Includ[redacted] with Report ☒ Email [redacted] @analyticallab.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) 17 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

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

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WIPE AND OTHER	SPORE TRAP	TAPE	SWAB
1007423-1	Main Armory Classroom	7/9	484					X		X						
1007423-2	Main Armory Drill Hall		444					X		X						
1007423-3	Blank		0					X		X						
1007423-4	Old Firing Range Painted Ceiling			100cm²				X				X				
1007423-5	Old Firing Range Floor			100cm²				X				X				
1007423-6	Old Firing Range Light			100cm²				X				X				
1007423-7	Outside Old Firing Range Door			100cm²				X				X				
1007423-8	2nd Fl Rm 209			100cm²				X				X				
1007423-9	2nd Fl Rm 205			100cm²				X				X				
1007423-10	3rd Fl Hallway Fl			100cm²				X				X				
1007423-11	Honor Guard - Table			100cm²				X				X				
1007423-12	Kitchen-Prep Table	↓		100cm²				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: 7/14/10 @ 1000 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: ____

2

BEST AVAILABLE COPY

Page 2 of 2

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

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NYLAP (#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: Pikesville Military Reservation
2. Job Location: Pikesville, MD
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Perso[redacted] @ phone # (410) 942-0273
5. Submitted by:[redacted]gnatur[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 Accomodate)	☒ Include COC/Field Data Sheets with Report ☒ Email: [redacted] @analyticallab.com @us.army.mil ☐ Fax: ☐ Verbal @us.army.mil

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

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

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

Metals Analysis
☐ Pb Paint Chip ____ (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
1007423-13	Assembly Hall Fl	7/9		100cm²				X				X				
1007423-14	Lg. Training Rm Win. Sill			100cm²				X				X				
1007423-15	Front Lobby Win. Sill			100cm²				X				X				
1007423-16	Armory-Stairwell							X			X					
1007423-17	Blank			0cm²				X				X				
1007423-18	Shop Area-Table			100cm²				X				X				
1007423-19	Rm 138A Mess Hall Table			100cm²				X				X				
1007423-20	Classroom Floor			100cm²				X				X				
1007423-21	Front Ent. Window Sill			100cm²				X				X				

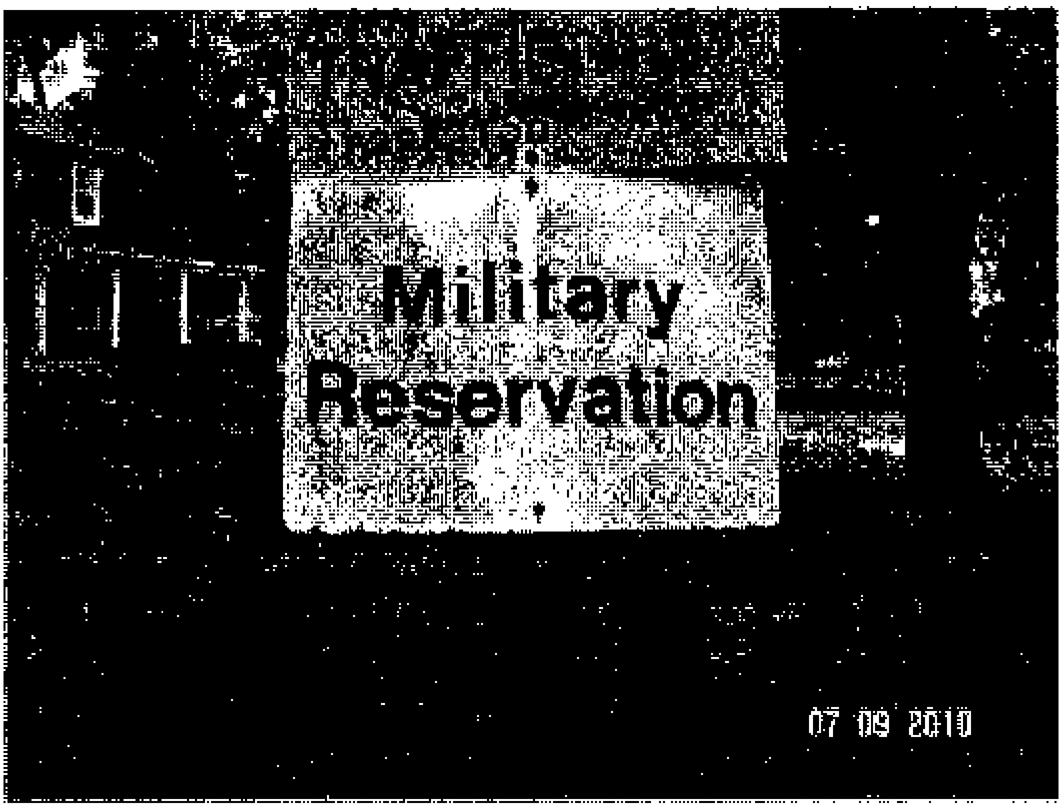
CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

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: ___

DC

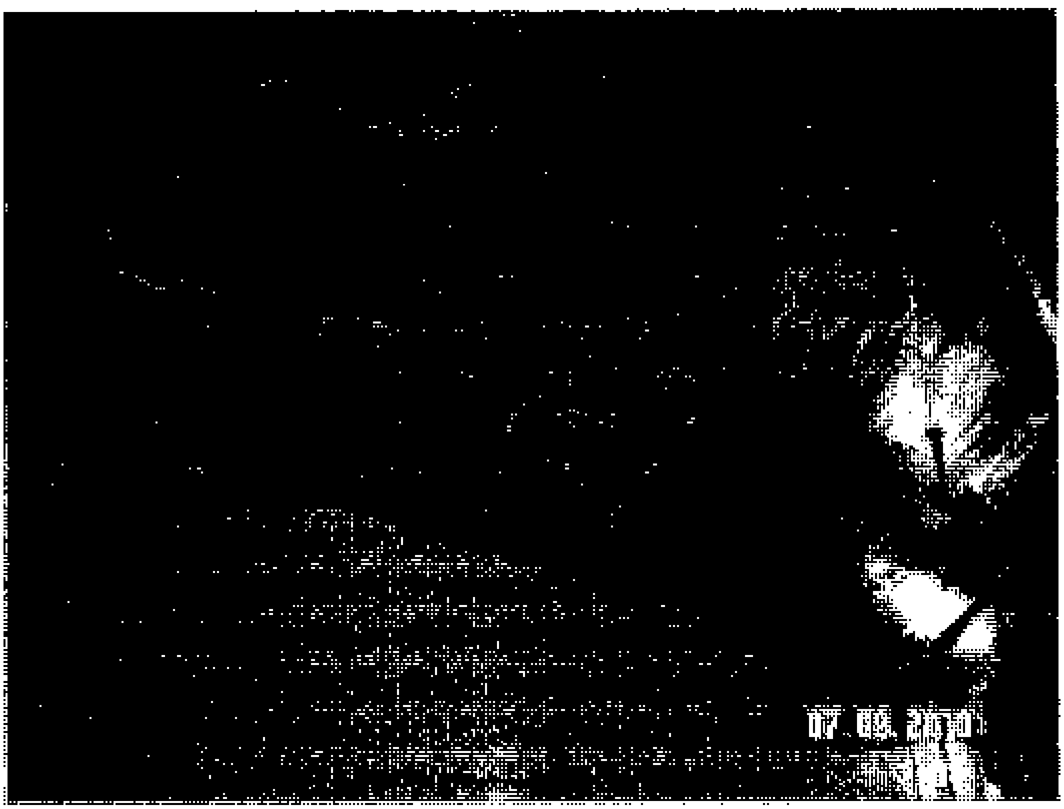
Appendix B
Photographs

Exterior sign

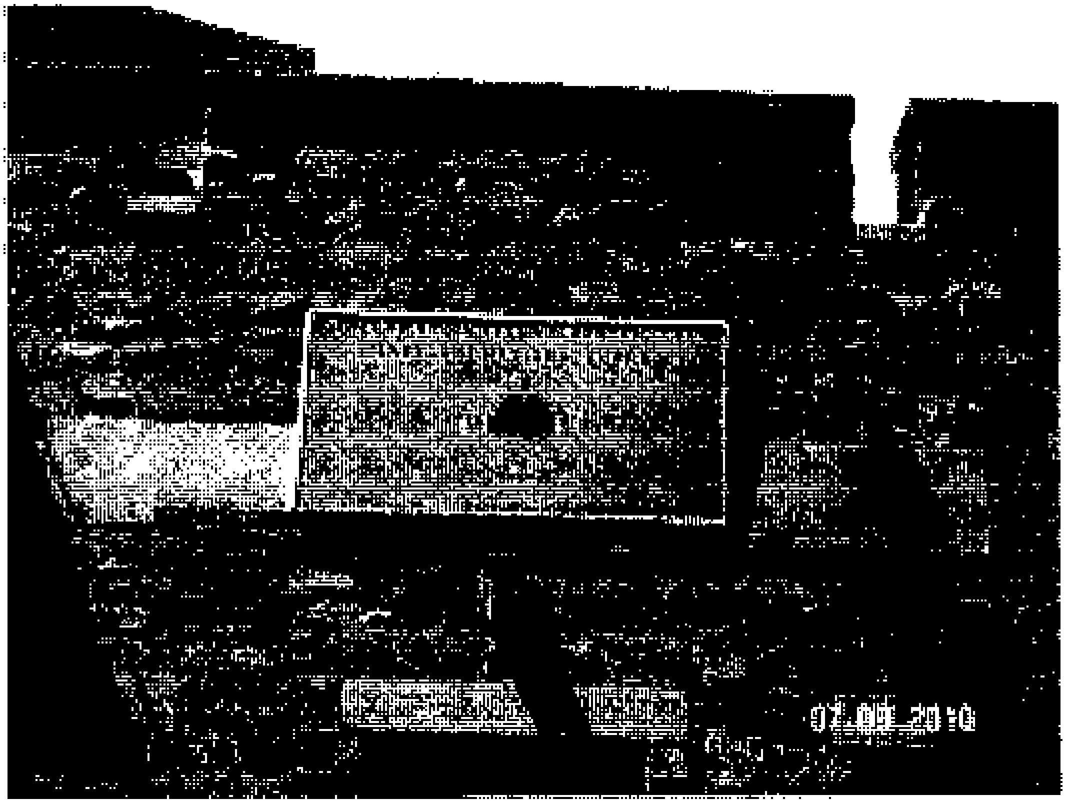


Exterior sign

Administration building, exterior



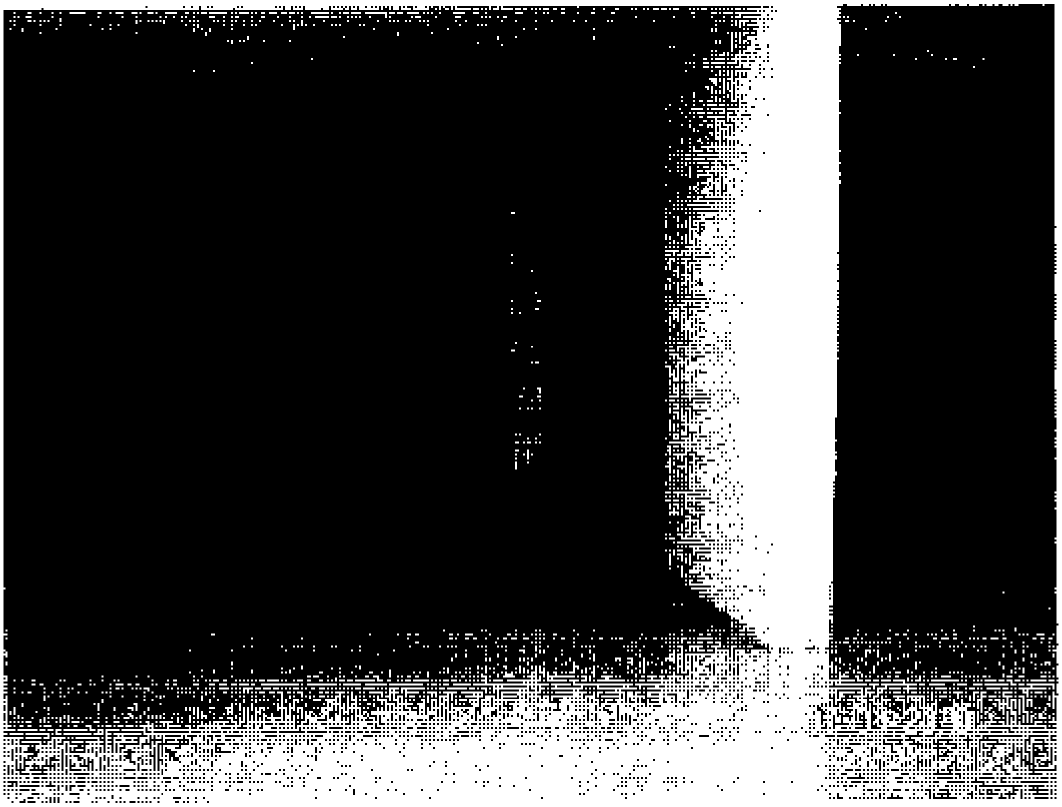
Damaged ceiling, large training room



IT, exterior

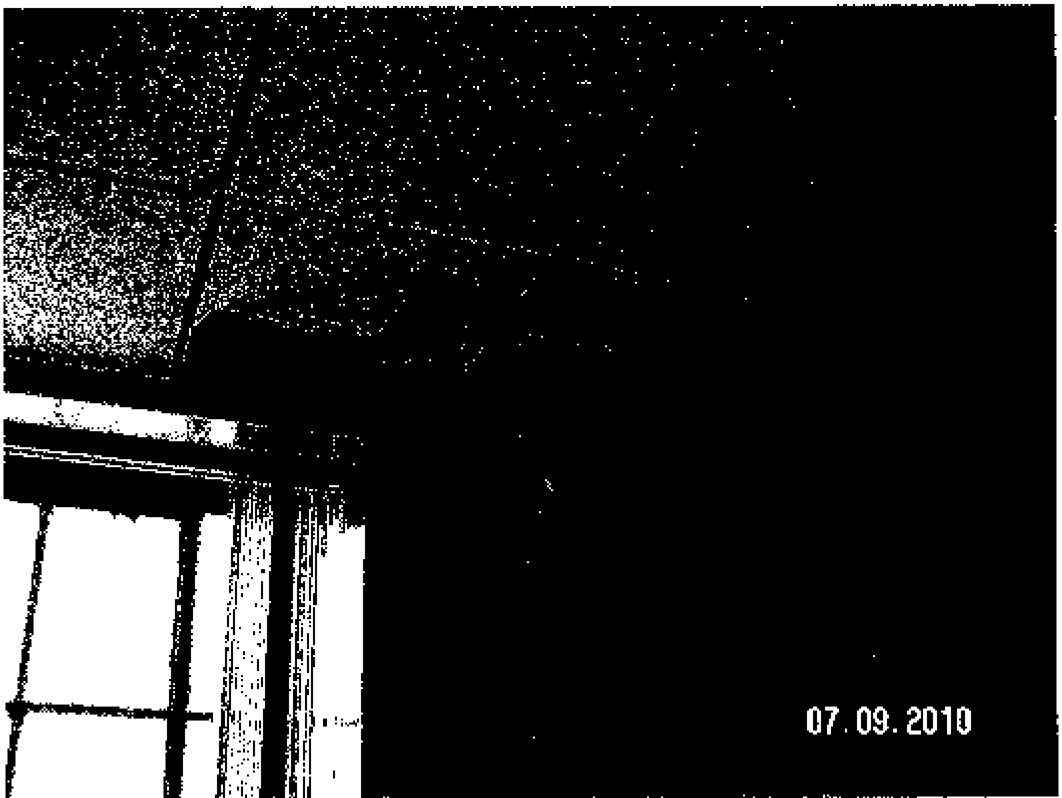
Armory, exterior

BEST AVAILABLE COPY

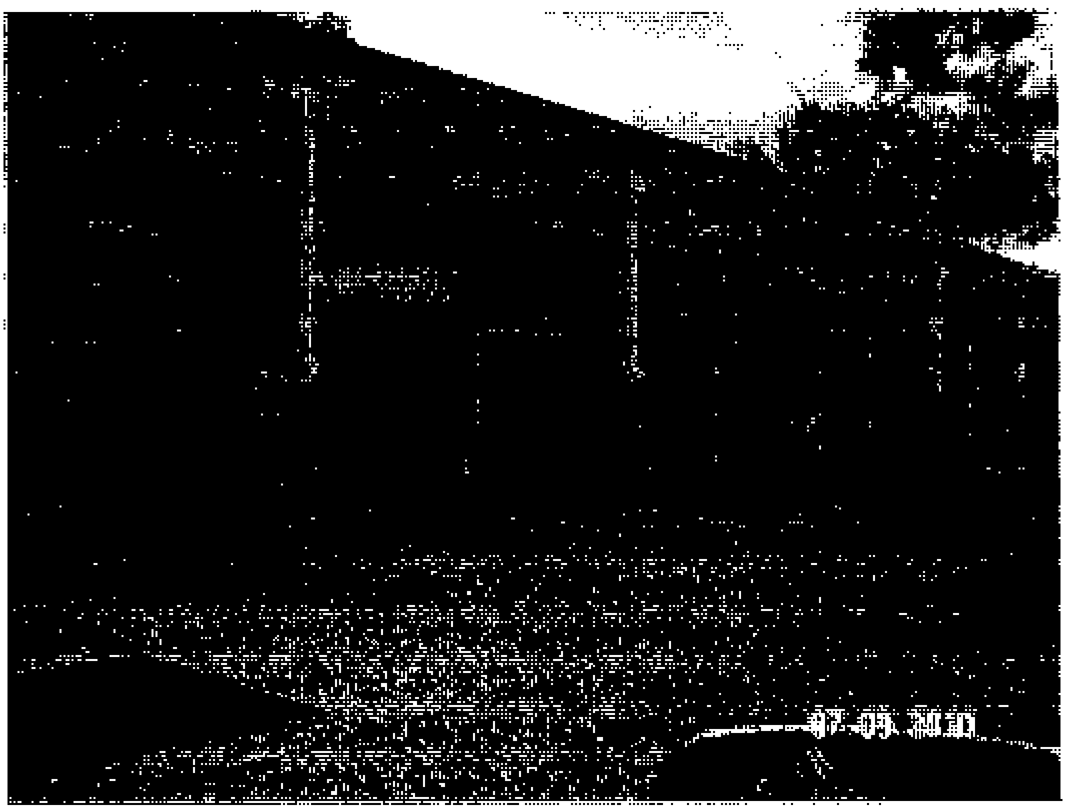


Old firing range

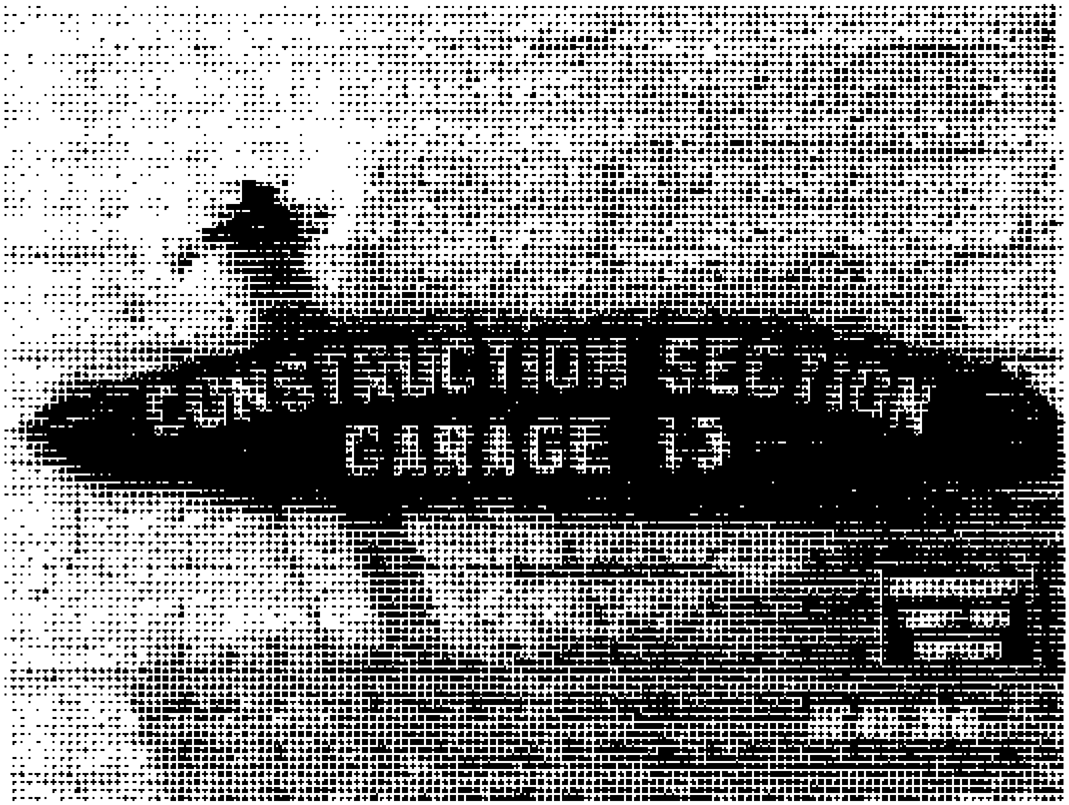
Damaged ceiling tiles and suspect ACM in Honor Guard area, 3rd floor



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

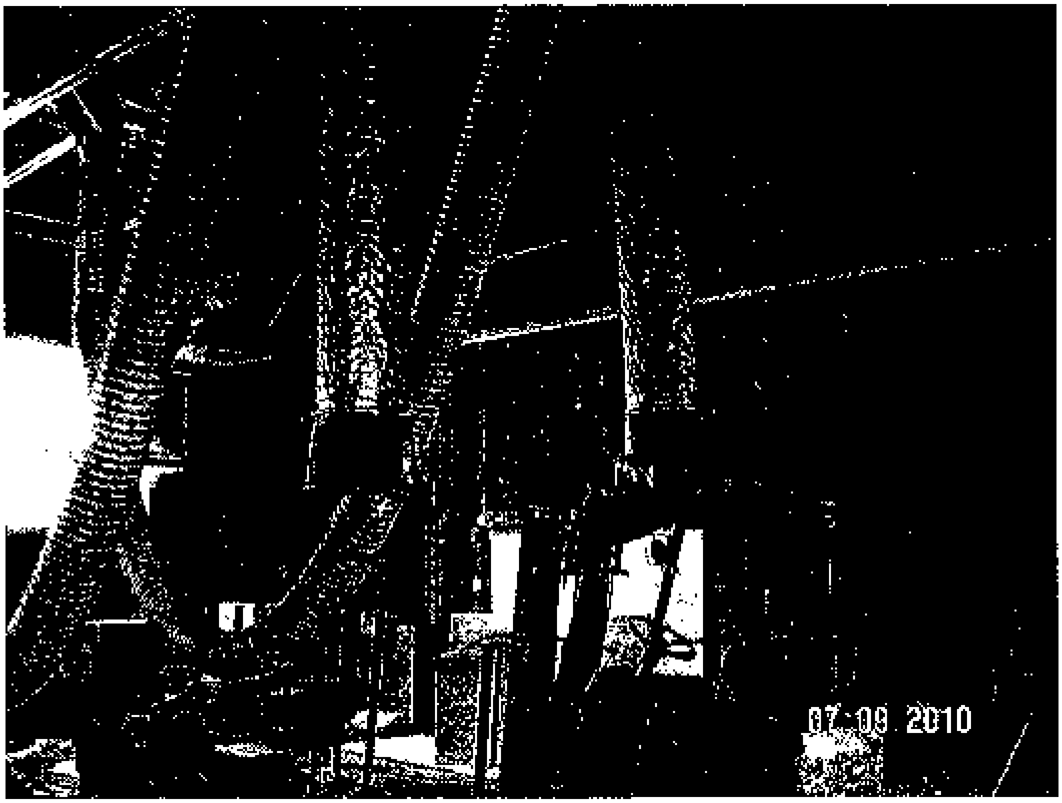


Garage, exterior

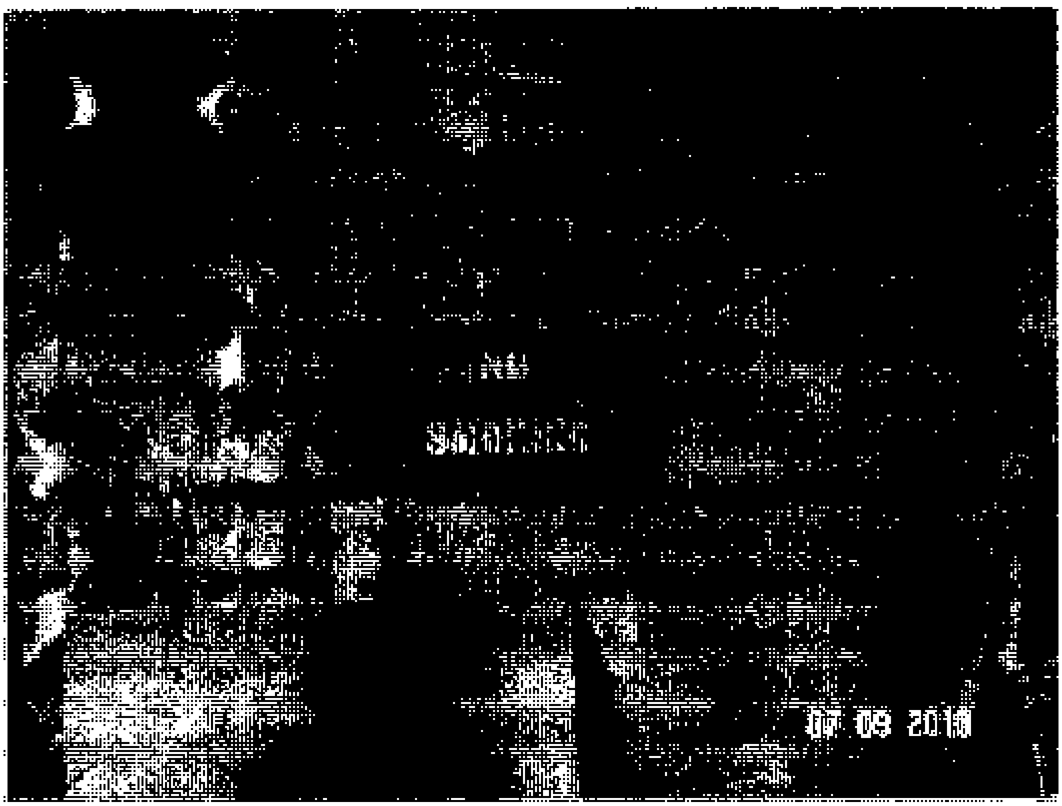


Construction shop, exterior

Construction shop, exterior



Vehicle local exhaust ventilation



Safety posting

Appendix C
Floor Plans

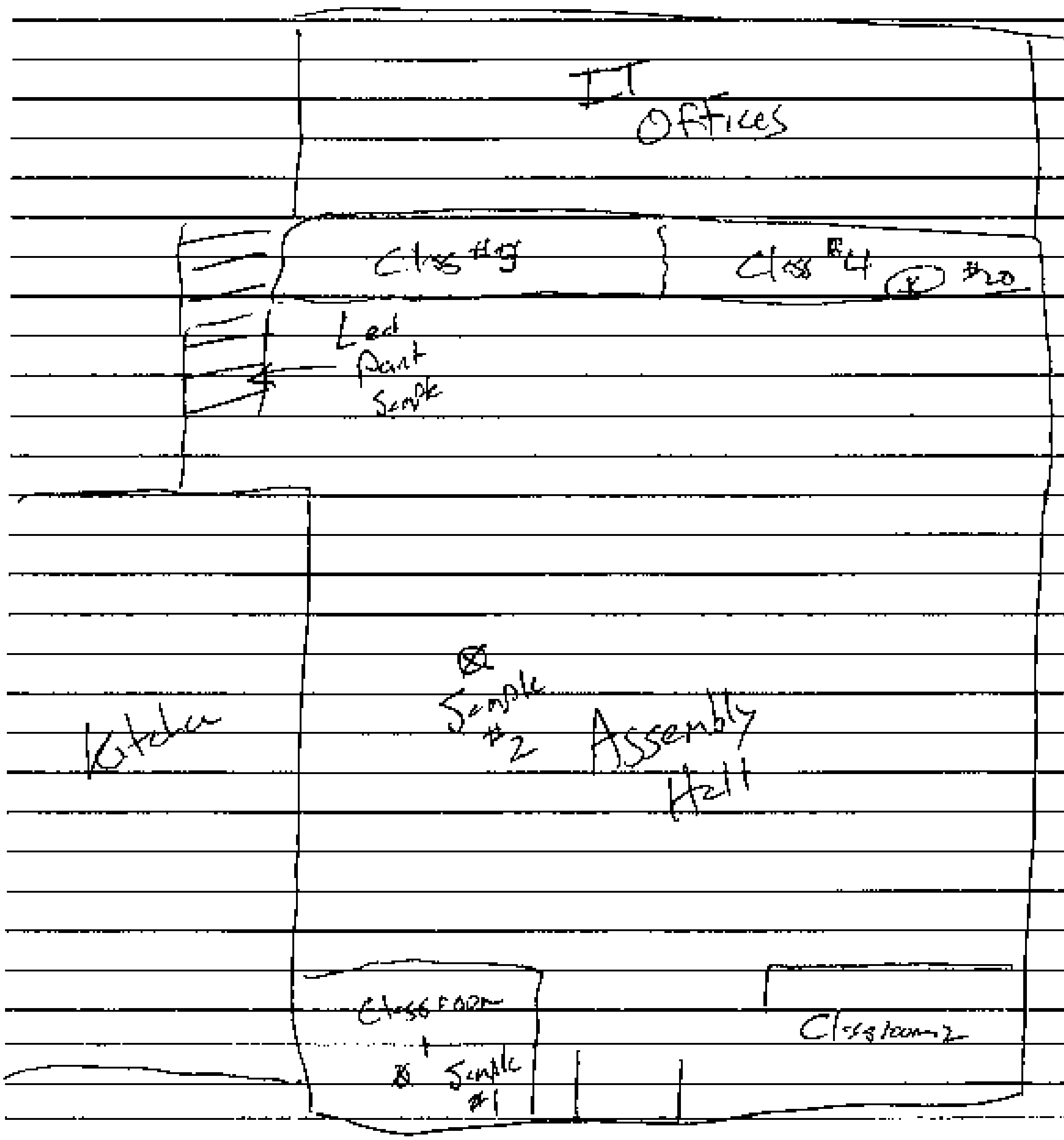
ANALYTICAL LABORATORY SERVICES, INC.
Environmental ✦ Industrial Hygiene ✦ Field Services
www.analyticallab.com

ALSI Daily Notes

Date: 7/9/10

Project Name: Pikesville Military Reservation

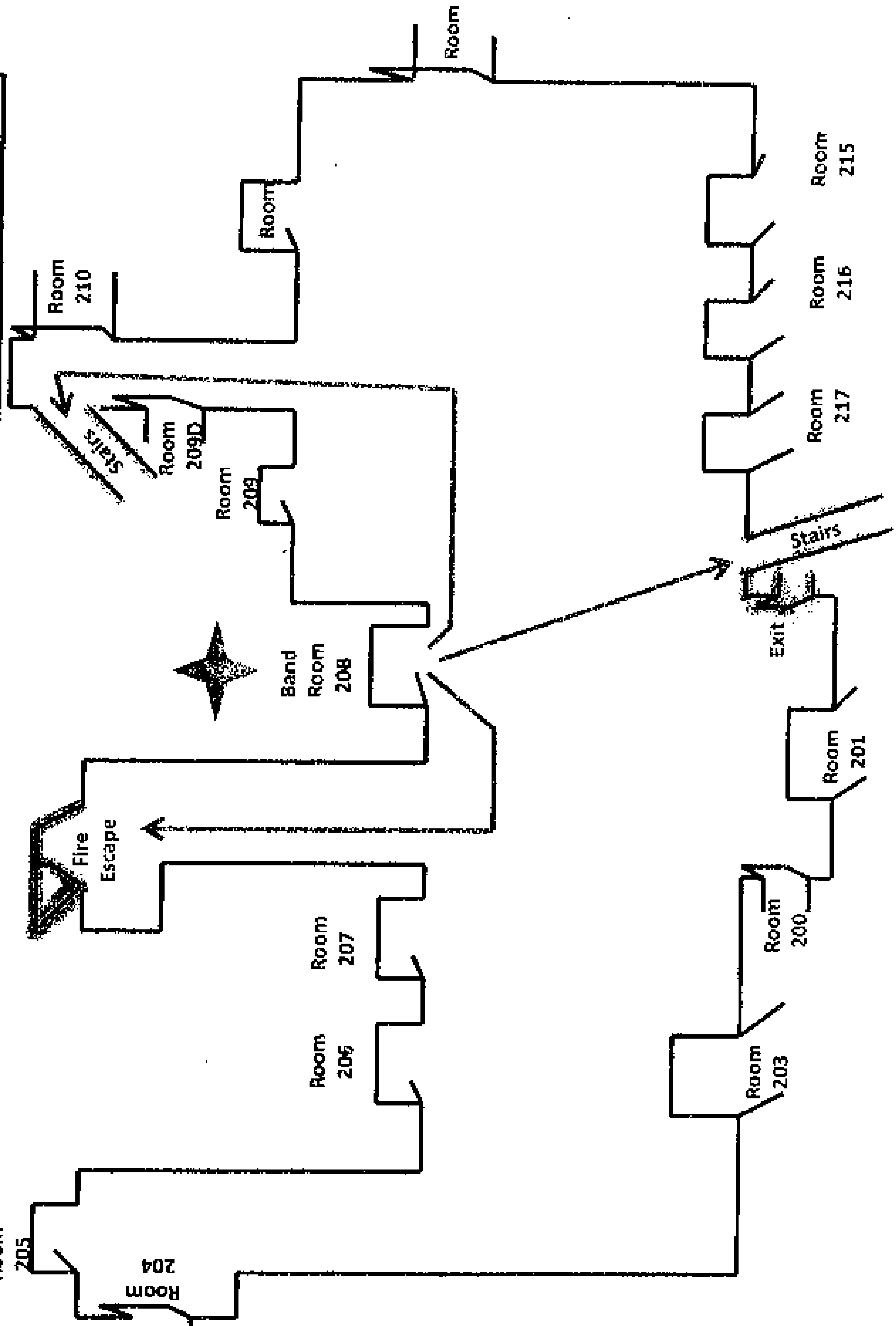
Armory - 1st Floor



3544 North Progress Avenue ✦ Suite 100 ✦ Harrisburg, PA 17110
TEL: 717-545-3424 ✦ FAX: 717-540-3428

Armory 2ND Floor

FIRE EVACUATION PLAN

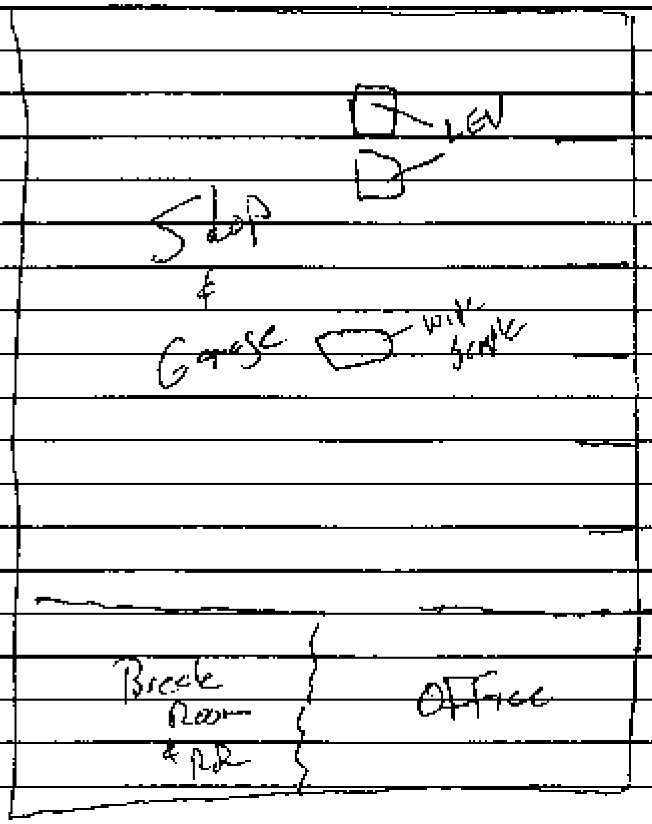


ANALYTICAL LABORATORY SERVICES, INC.
Environmental ✦ Industrial Hygiene ✦ Field Services
www.analyticallab.com

ALSI Daily Notes

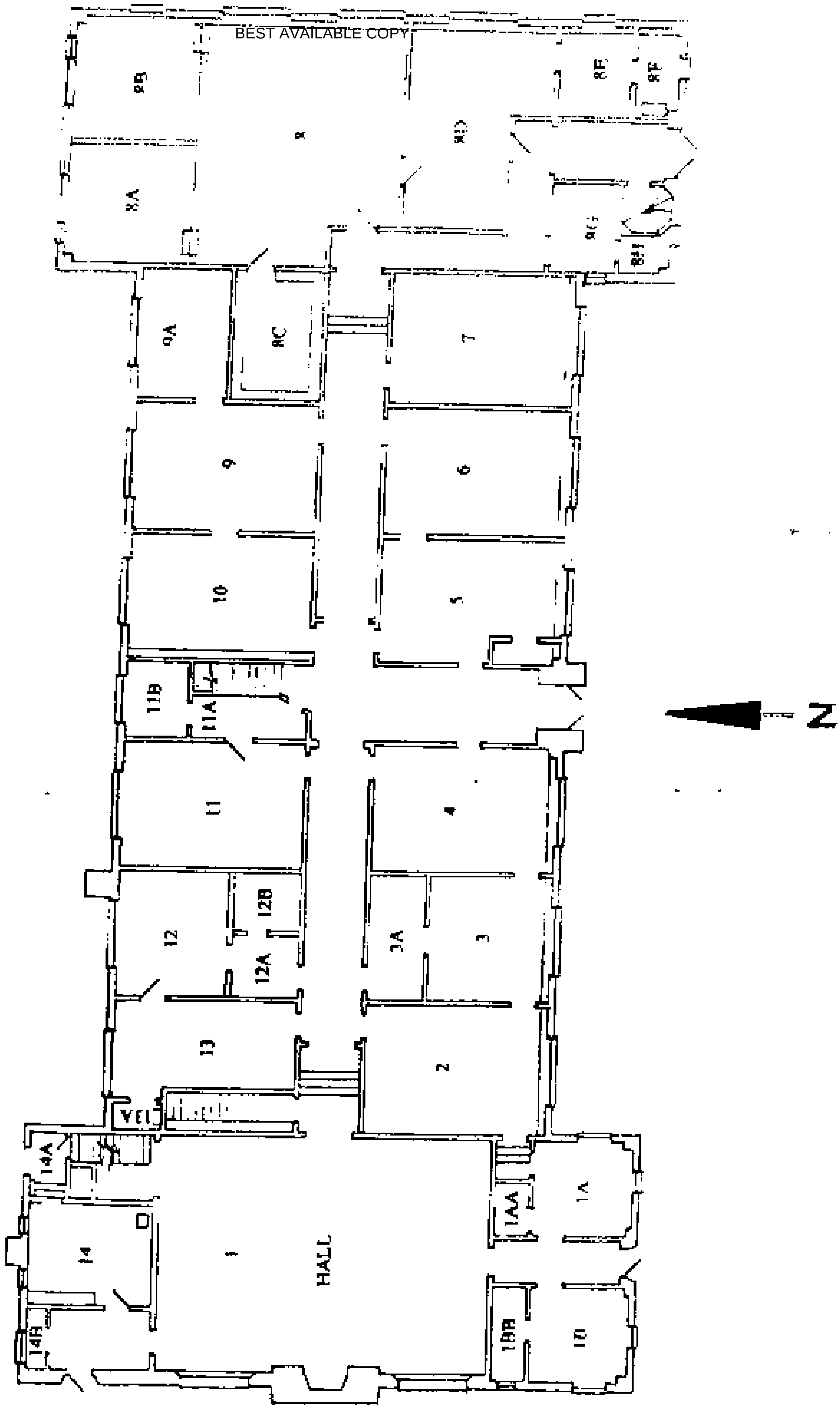
Date: 7/9/10 Project Name: Pikesville Military Res.

Construction Shop



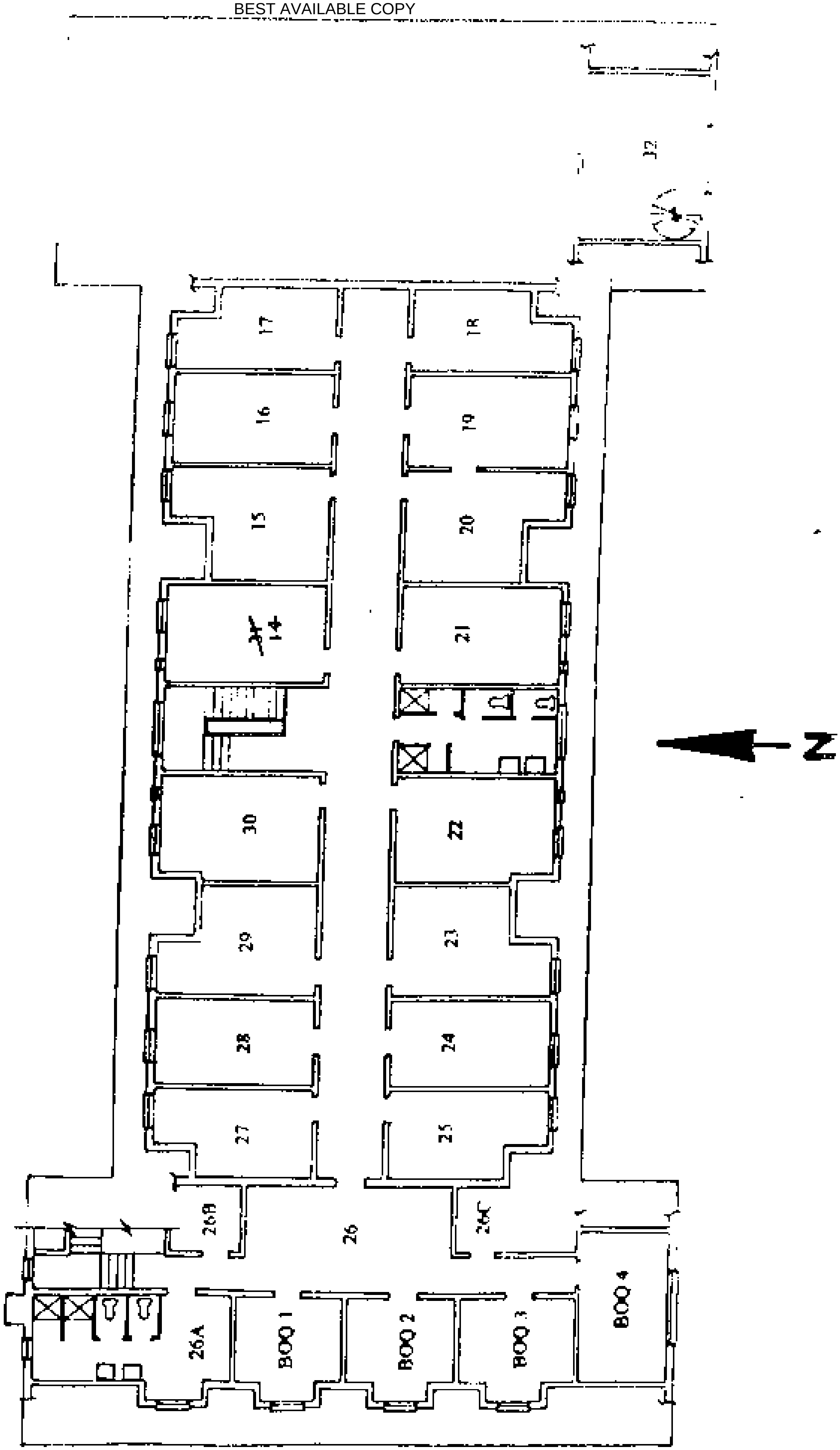
3544 North Progress Avenue ✦ Suite 100 ✦ Harrisburg, PA 17110
TEL: 717-540-3424 ✦ FAX: 717-540-3426

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



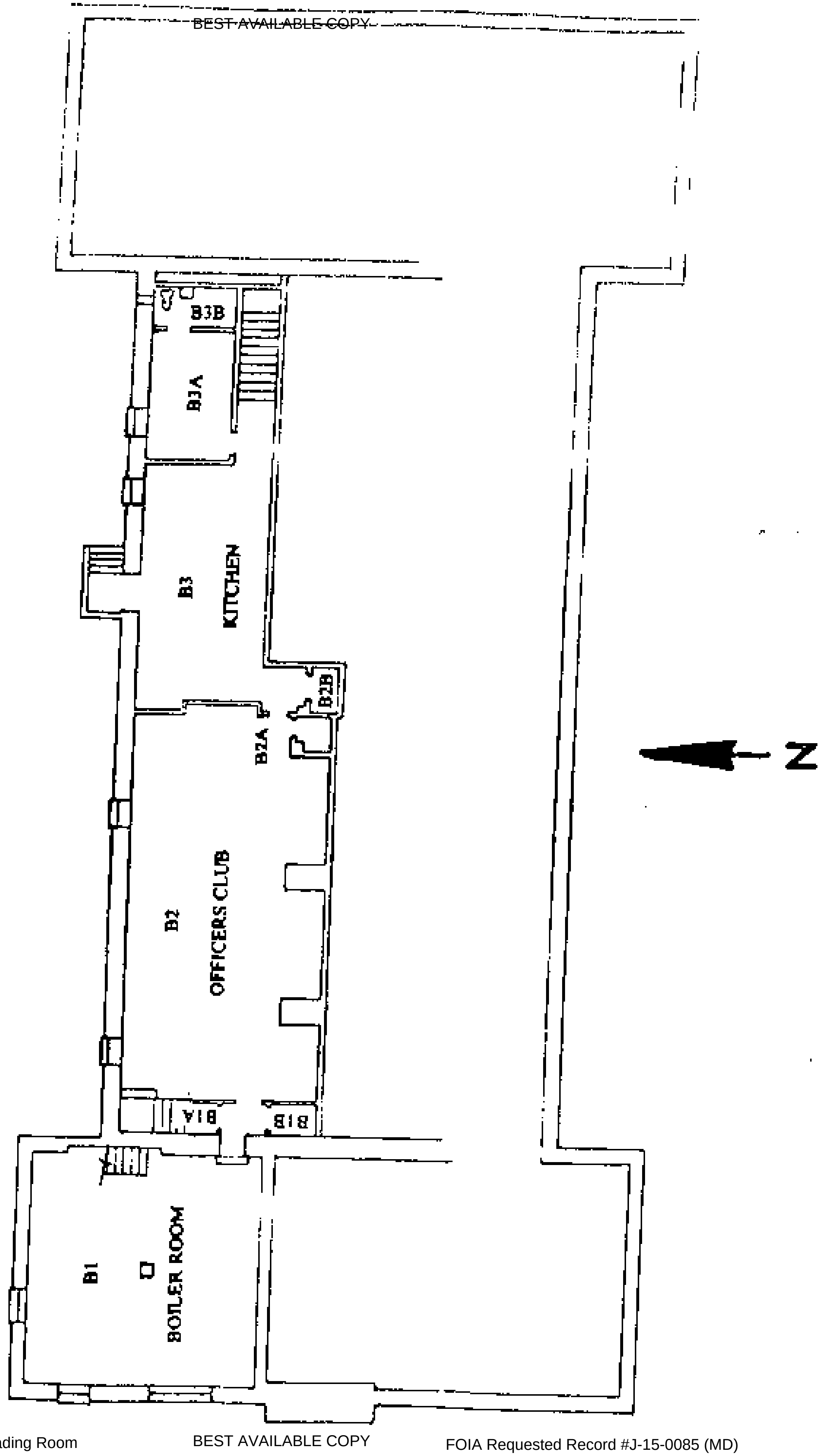
BG (MD) JOHN S. EDWARDS BUILDING
58TH BDE ADMINISTRATION

SECOND FLOOR PLAN
NOT TO SCALE



BG (MD) JOHN S. EDWARDS BUILDING
58TH BDE ADMINISTRATION

BASEMENT FLOOR PLAN
NOT TO SCALE



Appendix D
References

BEST AVAILABLE COPY

Appendix D. References

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

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

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

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

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

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

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

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

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

BEST AVAILABLE COPY

CMI
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
Pikesville Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Pikesville Readiness Center** **610 Reisterstown Road** **Pikesville, MD 21208**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**July 2, 2013**
Report Date:	**July 31, 2013**

Non-Responsive
[redacted]

Manager, Industrial Hygiene Services

BEST AVAILABLE COPY

Table of Contents

Section 1.0 Executive Summary

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

1. Surface samples for lead exceeded the NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges recommended guideline in several locations. Peeling paint was observed in two locations. See Section 3.0 for detailed sampling results.

2. Lighting levels met the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in all locations tested. See Section 4.0 for detailed findings.

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

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

    b. The relative humidity levels exceeded the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in the drill hall.

    c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 parts per million (ppm).

    d. Carbon dioxide (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) were found to be intact and in good condition.

BEST AVAILABLE COPY

Section 2.0 Operation Description & Observations

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

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

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

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

There is no child-care facility in the building.

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

This facility has a converted firing range that is now used as storage. It was reported that the range has been abated two times.

Housekeeping practices were good.

BEST AVAILABLE COPY

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	*	<6.7	*
2	Converted Firing Range	*	<6.7	*
3	Drill Hall – Floor	*	*	<110
4	Drill Hall – Top of Bleachers	*	*	160
5	**Drill Hall – Top of Electrical Box**	*	*	**1,800**
6	Kitchen – Top of Ice Machine	*	*	<110
7	Kitchen – Top of Food Mixer	*	*	<110
8	Hallway – Outside of Firing Range	*	*	<110
9	**Converted Firing Range – Floor**	*	*	**750**
10	Converted Firing Range – Top of Wall Locker	*	*	170
11	**Converted Firing Range – Window Sill**	*	*	**300**
12	Room 103 – Desk	*	*	<110
13	Room 102 – Desk	*	*	<110
14	**Supply Wall Locker Storage Area – Top of Wall Locker**	*	*	**710**
15	Room 304 – Top of File Cabinet	*	*	<110
16	Blank – Wipe	*	*	<12 ug
17	Blank – Air		<3 ug	*
19	Stairway 1st to 2nd Floor	0.34	*	*
20	Stairway 2nd Floor	**0.58**	*	*
-	**Criteria**	**0.5**	**50**	**200**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2 =** micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

BEST AVAILABLE COPY

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

- Surface levels of lead were above the recommended guideline of 200 ug/ft^2 in the following locations:

    - Drill hall top of electrical box
    - Converted firing range floor
    - Converted firing range window sill
    - Supply wall locker storage area top of wall locker

    Cleaning and housekeeping should be improved in any location where lead was identified in surface samples above the detection limit.

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

- One of the two paint chip samples analyzed met the EPA/HUD definition of lead-based paint. All areas of damaged and peeling paint should be repaired and repainted using methods to control dust (e.g., wet methods) by properly trained and protected workers.

BEST AVAILABLE COPY

Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98011EL). The light meter was last calibrated in November 2012. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Drill Hall	25.2	10	Yes
Room 103 Classroom 3	66.1	30-50	Yes
Room 104 Classroom 4	71.3	30-50	Yes
Kitchen	102.1	50	Yes
Room 102 Classroom 2	97.1	30-50	Yes
Room 101 Classroom 1	132.4	30-50	Yes
Converted Firing Range/Storage	81.9	30	Yes
Honor Guard Office	143.1	30-50	Yes
Weight Room	152.8	30	Yes
Supply Wall Locker Storage	135.8	30	Yes
Stable/Storage Area	23.1	10	Yes

Table Notes:

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

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

The lighting levels measured met the minimum recommended guideline.

Section 5.0 Indoor Air Quality

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

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

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Honor Guard Office	76.6	45.0	557	0.0
Drill Hall	**81.7**	**69.3**	331	0.0
Outdoors	81.1	71.8	354	0.0
Criteria	**68-79**	**30-60**	**<1,054**	**<9**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **°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 above the recommended guideline of 68-79°F in the drill hall. For comfort, maintain temperature between 68-79 degrees F during occupied periods.

- Relative humidity levels were about the recommended guideline of 30-60% in the drill hall. Maintain humidity levels between 30-60 percent.

- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level for this survey. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,054 ppm in sampled areas. This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm in sampled areas. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide

- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. No significant concerns were noted or reported during this survey.

BEST AVAILABLE COPY

Section 6.0 Suspect Asbestos Containing Building Materials

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

1. Window glazing in the third floor weight room was sampled and analyzed for asbestos content. No asbestos was identified in this sample. See enclosed Laboratory Analysis Report in Appendix A.

2. Pipe insulation and mudded joint fittings were observed to be present throughout the facility. These materials were found to be intact and in good condition.

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

BEST AVAILABLE COPY

Section 7.0 Equipment

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

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	02041015	8/2012	NA
Cal Light 400 Light Meter	98011EL	11/2012	NA
SKC Air Sampling Pump	798129	7/2/13	2.5 LPM
SKC Air Sampling Pump	767926	7/2/13	2.5 LPM

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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:**	516266
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Pikesville, RC	**Date Submitted:**	7/9/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	7/16/2013 **Report Date:** 7/16/2013

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

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

BEST AVAILABLE COPY

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

BEST AVAILABLE COPY

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:**	516266
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Pikesville, RC	**Date Submitted:**	7/9/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	7/16/2013 **Report Date:** 7/16/2013

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.

Nida McGarvey / K Shipe

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

BEST AVAILABLE COPY

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) **516266**

(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: ARNG MD
2. Job Location: Pikesville RC
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person [redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted] Signature: [redacted]

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

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

NORMAL BUSINESS HOURS (NOW)
~~☒ Immediate~~ ☐ 3 Day
☐ Next Day ☒ 5 Day + Date Due: 7/16/13
☐ 2 Day
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Inclu[redacted]with Report
☒ Ema[redacted]@compliance.place.cu...
☐ 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 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) 19 (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	7-2	450					X		X						
2 Converted Range	7-2	450					X		X						
3 Drill Hall floor			100 cm²				X				X				
4 Drill Hall Bleachers							X				X				
5 Drill Hall Elc. Box							X				X				
6 Kitchen - Ice Machine							X				X				
7 Kitchen - food Mixer							X				X				
8 Hallway outside Range							X				X				
9 Converted Range - floor							X				X				
10 Range wall locker							X				X				
11 Range window sill							X				X				
12 Room 103 - Desk							X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
TAT changed to comply w/ Gov't contract.
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY (CUSTODY)
1. Date/Time RCVD: 7/9/13 @ 1020 Via: FedEx By (Print): [signature] Sign: [signature]
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): Sign:
3. Results Reported To: ____ Via: ____ Date: ___/___/___ Time: Initials:
4. Comments: 7995 2491 4772

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) 5162266 (page 2 of 2)

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

Submittal Information:
1. Job Name: ARNG - MD
2. Job Location: Pikesville - RC
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Pers Non-Responsive [redacted] @ phone # (410) 942-0273
5. Submitted by [redacted] Signature: Non-Responsive [redacted]

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

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ____ ☐ 24 Hours Time Due: ____ Comments: ____	☑ Immediate ☐ 3 Day ☐ Next Day ☐ 5 Day + ☐ 2 Day Date Due: ____ ☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)	☒ Incl Non-Responsive [redacted] with Report ☒ Ema [redacted] compliance pha. 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____)____(QTY)
- ☐ Pb Air____(QTY)
- ☐ Pb Soil/Solid____(QTY)
- ☐ Pb TCLP____(QTY)
- ☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
- ☐ Pb Furnace (Media____)____(QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples:____
Collection Media____
- ☐ Spore-Trap____(QTY) ☐ Surface Vacuum Dust____(QTY)
- ☐ Surface Swab____(QTY) ☐ Culturable ID Genus (Media____)____(QTY)
- ☐ Surface Tape____(QTY) ☐ Culturable ID Species (Media____)____(QTY)
- ☐ Other (Specify____)____(QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13	Room 102 Desk	7.2		100 cm²				X				X				
14	Locker Storage Locker							X				X				
15	Room 304 ~~Desk~~ File Cab.							X				X				
16	Blank - wipe			0				X				X				
17	Blank		0					X		X						
18	Window Glazing						X				X					
19	Stairway - Paint chips 1+2							X			X					
20	Stairway 2 to out Paint chip							X			X					

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time: Contact: By:

Date/Time: Contact: By:

Date/Time: Contact: By:

LABORATORY STATIONS: (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

BEST AVAILABLE COPY

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

Client:	National Guard Bureau	**Job Name:**	ARNG MD	**Chain Of Custody:**	516266
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Pikesville, RC	**Date Analyzed:**	7/12/2013
	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
13076022	18	NAD	--	--	--	--	--	--	--	--	--	100	WG	Gray	Homogeneous	SW	

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

BEST AVAILABLE COPY

OW (410) 247-2024 159202 210 REV. 8.08

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) **516266**

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: Pikesville RC
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person: Non-Responsive [redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted] Signature: Non-Responsive [redacted]

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

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

NORMAL BUSINESS HOURS
~~☒ Immediate~~ NOW
☐ Next Day
☐ 2 Day
☐ 3 Day
☒ 5 Day + Date Due: 7/16/13
☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

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

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____(QTY)
☐ Fiberglass ____(QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____(QTY)
☐ NIOSH 7402 ____(QTY)
☐ Other (specify ____) ____(QTY)
PLM Bulk
☒ EPA 600 – Visual Estimate 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	7-2	450					X		X						
2	Converted Range	7-2	450					X		X						
3	Drill Hall Floor			100 cm²				X				X				
4	Drill Hall Bleachers							X				X				
5	Drill Hall Elec Box							X				X				
6	Kitchen Ice Machine							X				X				
7	Kitchen Food Mixer							X				X				
8	Hallway outside Range							X				X				
9	Converted Range floor							X				X				
10	Range wall locker							X				X				
11	Range window sill							X				X				
12	Room 103 - Desk							X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
TAT changed to comply w/ Federal contract.
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY USE ONLY:
1. Date/Time RCVD: 7/9/13 @ 1020 Via: FedEx By (Print): Sign:
2. Date/Time Analyzed: 7/12/13 @ By (Print): Wilkin Sign:
3. Results Reported To: Via: Date: 7/12/13 Time: Initials:

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) 5162266

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: Pikesville RC
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person: Non-Responsive [redacted] @ phone # (410) 942-0273
5. Submitted by: Signature: Non-Responsive [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	☒ Include COC/Field Data Sheets with Report
☐ 24 Hours Time Due:	☐ Next Day ☐ 5 Day + ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ Email: Non-Responsive [redacted] @us.army.mil
Comments:	☐ 2 Day Date Due:	☐ 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) PLM/TEM __ (Qual) PLM/TEM __ (Quan)

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

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

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

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

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

Fungal Analysis

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

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13 Room 102	Desk	7-2		100 cm²				X				X				
14 Locker Storage	Locker	↓		↓				X				X				
15 Room 301	File Cab	↓		↓				X				X				
16 Blank - wipe		↓		0				X				X				
17 Blank		↓	0					X		X						
18 Window Glazing		↓					X				X					
19 Stairway - Paint chips	1st-2	↓						X			X					
20 Stairway 2nd to 3rd Paint Chip		↓						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:

Appendix B. Photographs

BEST AVAILABLE COPY

Exterior of the facility

Exterior old stables/storage areas

Inside view of a old stable/storage area

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

Drill Hall

Converted firing range/storage area

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

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

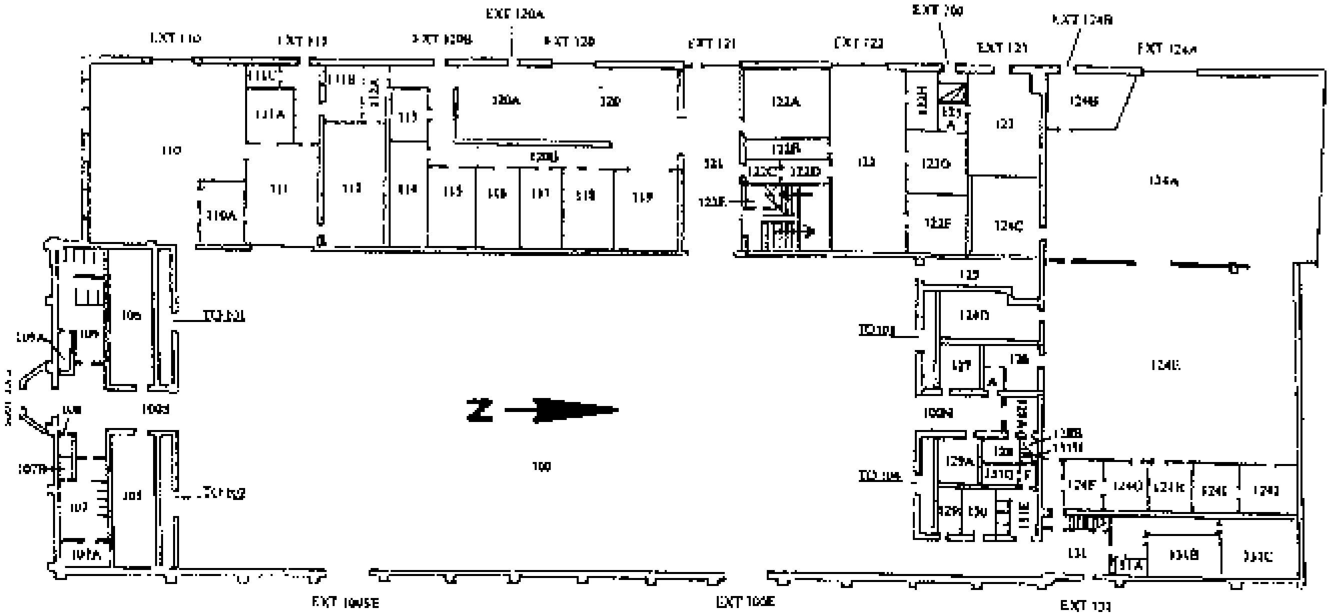
Stairway from first to second floor peeling brown paint

Stairway from second floor to exterior peeling blue paint

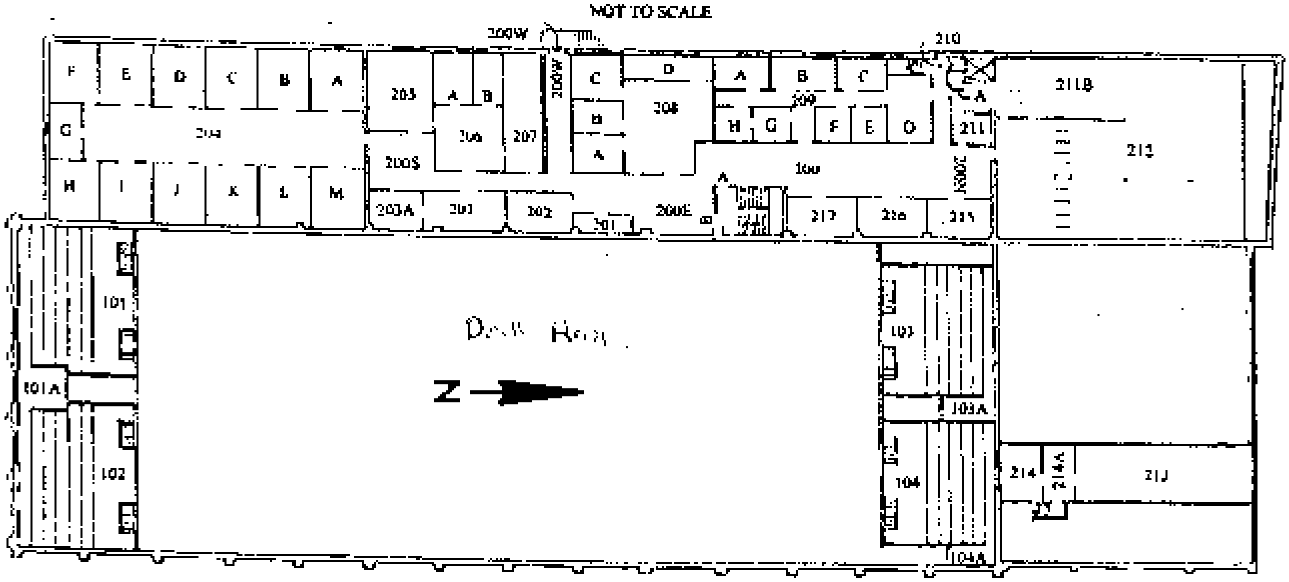
Appendix C. Floor Plan

BEST AVAILABLE COPY

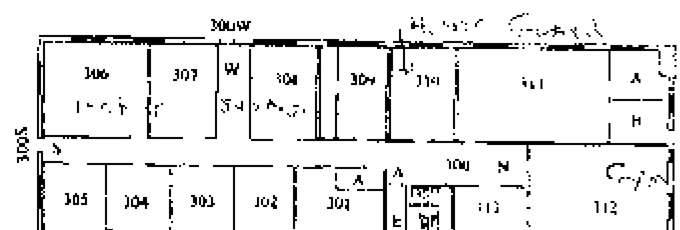
MG JOHN PURLEY COOPER, JR. BUILDING
PIKESVILLE ARMORY
FIRST FLOOR PLAN
NOT TO SCALE



MG JOHN PURLEY COOPER, JR. BUILDING
PIKESVILLE ARMORY
SECOND AND THIRD FLOOR PLAN
NOT TO SCALE



SECOND FLOOR



THIRD FLOOR

Appendix D. References

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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 SGT. Prince Frederick Armory, Prince Frederick, MD

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

2. Please direct any additional comments or concerns to Ms. [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

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

Approved for public release; distribution unlimited.

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

Readiness Thru Health

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

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

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

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

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

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

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

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

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

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

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

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS, MG (MD) PRINCE FREDERICK ARMORY
PRINCE FREDERICK, MD
PROJECT NO. 55-ML-01ED-03

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

2. CONCLUSIONS.

a. Indoor Air Quality. The armory meets the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) recommended guidelines for air quality for relative humidity and carbon dioxide levels. The indoor temperature of 80.5 degrees Fahrenheit exceeded the recommended ASHRAE guidelines. ASHRAE guidelines for an acceptable thermal environment are between 73-79 degrees Fahrenheit in the summer and between 68-74.5 degrees Fahrenheit in the winter. The indoor carbon dioxide levels ranged from 399- 1074 parts per million (ppm). To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm, totaling approximately 1050 ppm of carbon dioxide.

b. Building Issues. There is a leak in the roof with water damage in the second floor locker room and the renovated range area (rooms 1 and 4). The unit is in the process of getting bids to repair the roof.

c. Lead. All air samples were below the laboratory analytical detection limit for lead in air of 3.0 to 15.0 $\mu g/m^3$. All samples were also below the Occupational Health and Safety Administration (OSHA) standard of 50 $\mu g/m^3$ lead in air. One dust-lead wipe sample result, located on the window sill of the former indoor firing range (IFR) Room # 3, exceeded the USACHPPM recommended decontamination level of 200 $\mu g/ft^2$ for dust-lead on frequently contacted surfaces. One surface dust-lead wipe result, taken from the vehicle maintenance shop bay floor, exceeded the EPA exposure standard of 40 $\mu g/ft^2$ for children for dust-lead on floors.

d. Asbestos. There are presumed asbestos floor tiles in the armory.

Readiness thru Health
Printed on Recycled Paper

BEST AVAILABLE COPY

3. RECOMMENDATIONS.

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

a. Indoor Air Quality. The RAC for Indoor Air Quality. Thermal Environmental Conditions and Water Damage is classified as 5. Install more air conditioning units or fans to cool the armory to between 73-79 degrees Fahrenheit in the summer. The temperature in the winter should be between 68-74.5 degrees Fahrenheit. The indoor temperature of 84.9 degrees Fahrenheit exceeded the ASHRAE recommended guidelines for an acceptable thermal environment.

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

c. Lead. The RAC for this armory for Lead Exposure is classified as 5. Clean all areas in and adjacent to the former firing range rooms where sampling results showed lead residue. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. Apply a sealant to the area. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities. These workers are required to be in compliance with the OSHA lead in construction standard 29 CFR 1926.62. There is a potential for personnel taking lead contamination out of the workplace into their vehicles and homes. Wear disposable gloves and disposable coveralls as extra protection when working in areas identified as having elevated levels of lead. Test drinking water from water fountains and faucets for lead. Address all potential lead hazards before extending this facility to use for children. If children continue to use this facility, clean surfaces to the EPA dust-lead standards for young children of 40 $\mu g/ft^2$ on floors and 250$\mu g/ft^2$ for dust-lead on window sills.

d. Asbestos. The RAC for Asbestos Exposure is classified as 5. The presumed asbestos tiles are intact. If they become damaged in the future the asbestos tiles may become friable and asbestos fibers may be released. Army policy requires the armory to establish and execute an asbestos hazard management plan for all asbestos in the facility, and to take immediate corrective action where a possible asbestos-related health hazard has been identified. Provide a HAZCOM and Respiratory Protection Program for the full time state workers who oversee the armory.

BEST AVAILABLE COPY

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

TABLE OF CONTENTS

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: Prince Frederick Armory, Prince Frederick, MD

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

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

3. BACKGROUND INFORMATION.

a. Armory Mission. Engineering Support to the 121 Engineering Battalion, Company A.

b. Date of Construction. 1954

c. POC. SGM Non-Responsive [redacted] (410) 974-7400 Cell; (443) 277-4923.

d. Date of Survey. 3 September 2003.

4. SUMMARY OF ACTIONS.

a. Sampling. Surface dust-lead wipe and lead in air sampling was conducted to determine the existence of lead-based paint and/or lead-based paint hazards (paint-lead hazards). Carbon dioxide, temperature, and relative humidity measurements were collected to determine indoor air quality. Lighting conditions were measured. Sample results are in Appendix D.

b. Physical Condition of Facilities.

(1) Paint. The paint condition is intact. Sergeant Non-Responsive [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. In general the building is in good repair and the paint is intact. However there is a leak in the roof with water damage in the second floor locker room and the renovated range area (rooms 1 and 4). The unit is in the process of getting bids to repair the roof.

d. Safety and Industrial Hygiene Programs. There are no written program records at the armory. There is no Hazard Communication Program (HAZCOM) for the full time state workers who oversee the armory. They do have personal protective equipment (PPE) but no PPE program. They have material safety data sheets (MSDS) for the vehicle maintenance area of the facility.

e. Heating, Ventilation, and Air-conditioning System. There is no central ventilation and HVAC system. Ventilation and air are provided by window-mounted air conditioning units and the manual operation of windows when the building is not being heated.

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

g. Lighting. All Lighting was measured in twelve locations. Some measurements were taken with the lights off, because the rooms are normally used with the lights off. The list of locations measured and results are provided in Table 2, Appendix D.

h. Converted indoor firing range (IFR). Staff Sergeant [redacted], Environmental Compliance Assessment Coordinator for the MD NGB, stated that all lead was abated from the indoor firing range during its conversion. The IFR was converted to a distance-learning center. The range was divided into four rooms. The work has not been completed

i. Photographs (Appendix C).

j. Site Maps (Appendix B).

k. Facility use by children. The POC stated that the armory is used extensively by the community and has wide-ranging use by children. Youth groups play basketball on the drill floor.

BEST AVAILABLE COPY

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

6. SAMPLING RESULTS. Lead in air, surface dust-lead wipe, and indoor air quality sample results, as well as light measurements are shown in Appendix D. All air sample results were below the laboratory analytical detection limits of 3.0 μg/m³ and 15.0 μg/m³ lead in air, and the OSHA standard of 50 μg/m³ lead in air. One of 15 surface dust-lead wipes exceeded the USACHPPM recommended decontamination level of 200 μg/ft² for floors and other frequently-contacted surfaces. One sample exceeded the EPA lead exposure levels for children of 40 μg/ft²for floors.

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

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

BEST AVAILABLE COPY

Table 1: Q-Trak Measurements for Indoor Air Quality

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

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

Table 2: Lighting Measurements

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

7. DISCUSSION AND CONCLUSIONS.

a. The armory relative humidity met the recommended ASHRAE guidelines for air quality. The indoor temperature of 80.5 degrees Fahrenheit exceeds the recommended ASHRAE guidelines. ASHRAE guidelines for an acceptable thermal environment are between 73-79 degrees Fahrenheit in the summer and between 68-74.5 degrees Fahrenheit in the winter.

The indoor carbon dioxide levels met the ASHRAE recommended guidelines. The indoor carbon dioxide levels ranged from 399-1060 ppm. To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. Therefore the total carbon dioxide level should not exceed approximately 1050 ppm in this armory.

b. There is a leak in the roof with water damage in the second floor locker room and the renovated range area (rooms 1 and 4). The unit is in the process of getting bids to repair the roof.

c. All air samples are below the laboratory analytical detection limit for lead in air of 3.0 to 15.0 µg/m³. This is also below the Occupational Health and Safety Administration (OSHA) standard of 50 µg/m³ for lead in air. One dust-lead wipe sample result, located on the window sill of the former indoor firing range (IFR) Room # 3, exceeded the USACHPPM recommended decontamination level of 200 µg/ft² for dust-lead on frequently contacted surfaces.

BEST AVAILABLE COPY

One surface dust-lead wipe sample result exceeded the EPA lead exposure levels for children. The sample result was from the vehicle maintenance shop bay floor, and exceeded the EPA exposure standard of 40 $\mu g/ft^2$ for children for dust-lead on floors. AR 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them. Recleaning and sealing the distance learning center (former firing range rooms) room may further prevent exposures for children under six and for the general workforce.

d. There are presumed asbestos floor tiles in the armory. The presumed asbestos tiles are intact. If they become damaged in the future, the asbestos tiles may become friable and asbestos fibers may be released.

8. RECOMMENDATIONS. Enclosure.

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

PRINCE FREDERICK ARMORY RECOMMENDATIONS

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

1. Lead Exposure. RAC 5.

a. Clean all areas in and adjacent to the former indoor firing range rooms where sampling results showed elevated levels of lead. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. Apply a sealant to the area. These actions should be accomplished before allowing children into the area.

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

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

d. Test drinking water from water fountains and faucets for lead. It could not be determined if this has been done.

e. Address all potential lead hazards before extending this facility to use for children. If children will be using this facility, clean surfaces to the EPA dust-lead standards for young children of 40µg/ft² on floors and 250µg/ft² for dust-lead on window sills.

BEST AVAILABLE COPY

2. Indoor Air Quality. Thermal Comfort.

Install more air conditioning units or fans to cool the armory to between 73-79 degrees Fahrenheit in the summer. The temperature in the winter should be between 68-74.5 degrees Fahrenheit. The indoor temperature of 80.5 degrees Fahrenheit exceeds the ASHRAE recommended guidelines for an acceptable thermal environment. RAC 5.

3. Indoor Air Quality. Water Damage.

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

4. Asbestos Exposure.

The presumed asbestos tiles are intact. If they become damaged in the future the asbestos tiles may become friable and asbestos fibers may be released. Army policy requires the armory to establish and execute an asbestos hazard management plan for all asbestos in the facility, and to take immediate corrective action where a possible asbestos-related health hazard has been identified. RAC 5.

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

BEST AVAILABLE COPY

APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

BEST AVAILABLE COPY

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

BEST AVAILABLE COPY

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

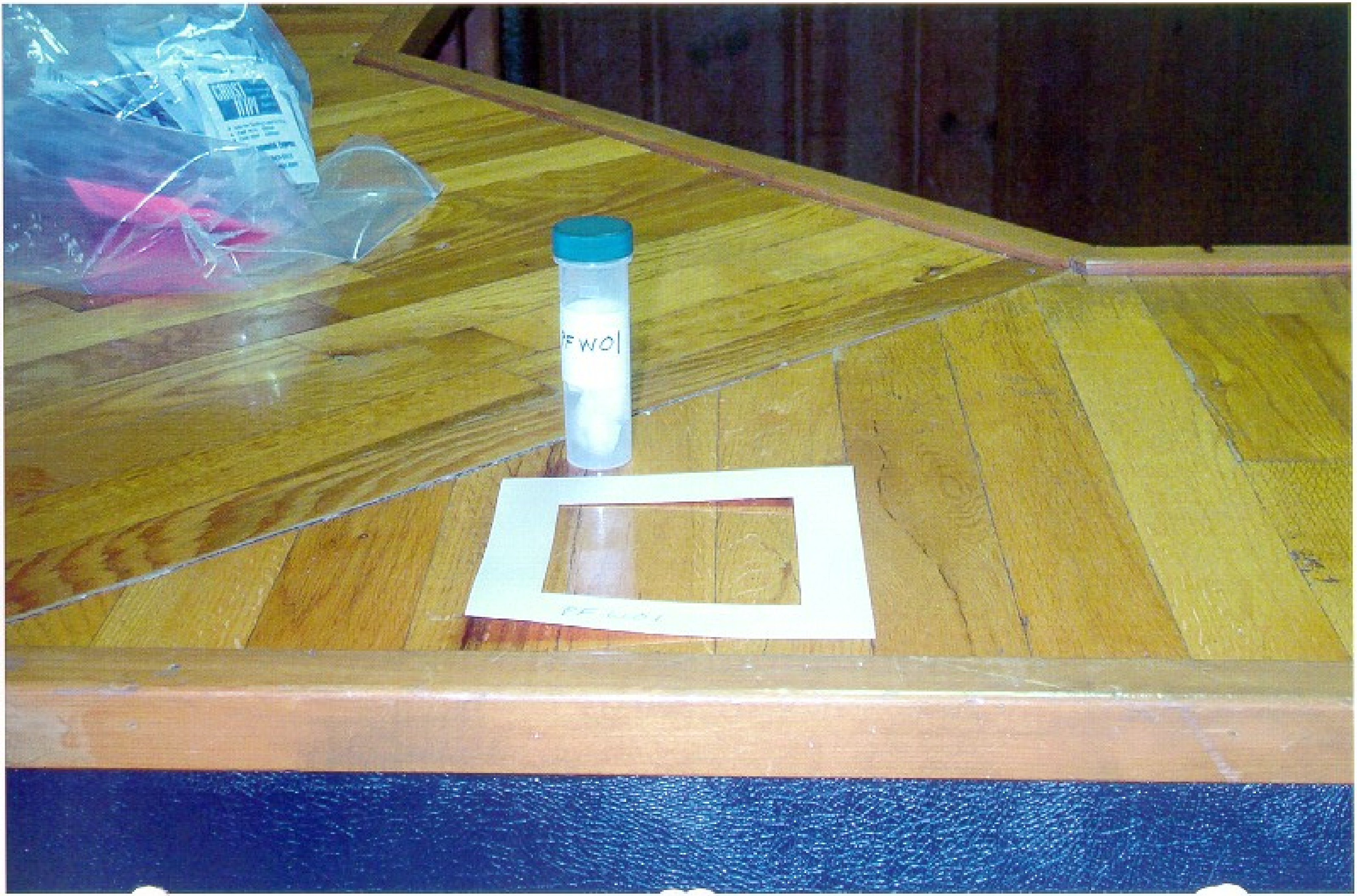
APPENDIX C

PHOTOGRAPHS

BEST AVAILABLE COPY

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

BEST AVAILABLE COPY

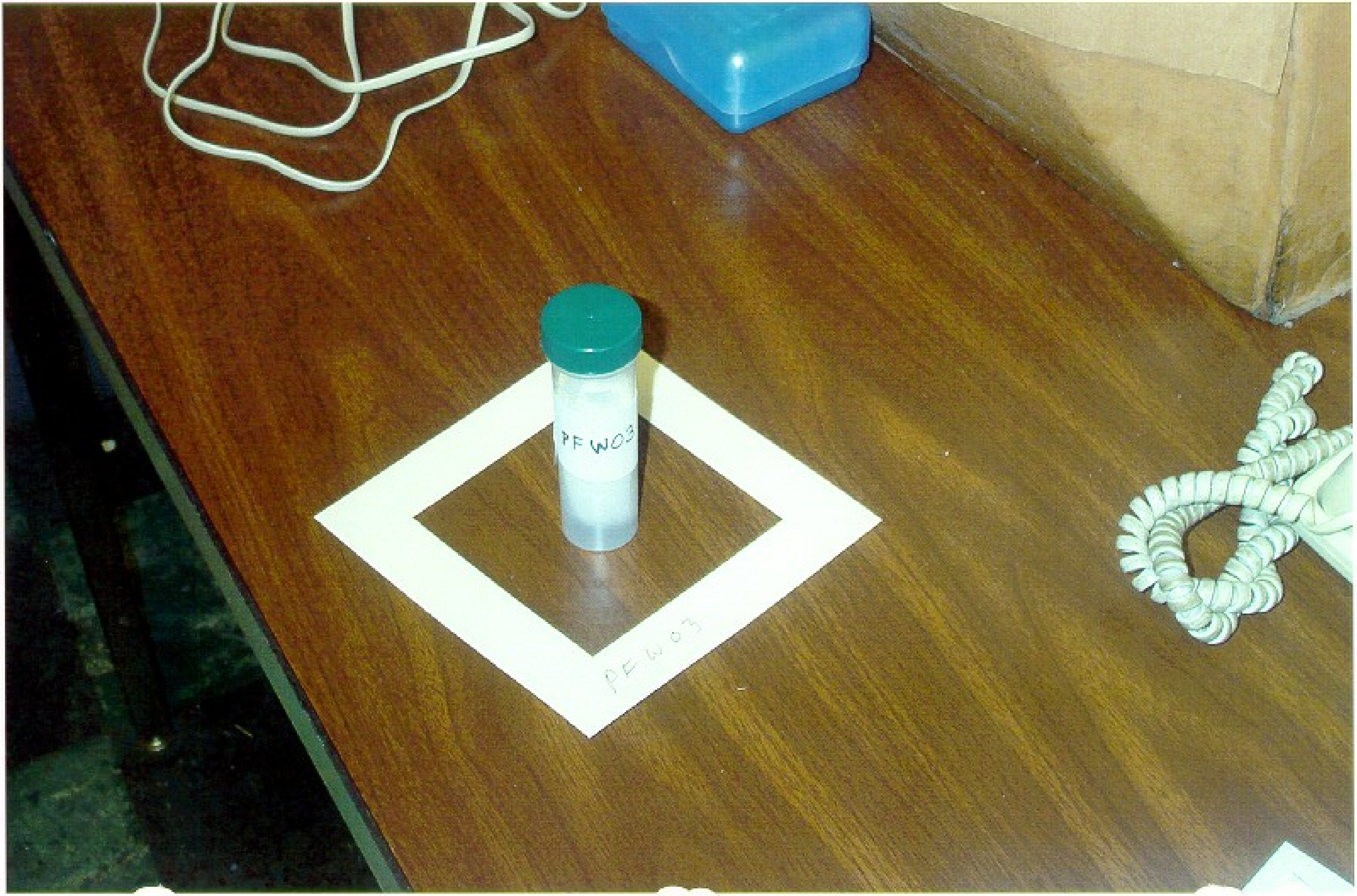


DCP_0956.JPG Unknown

BEST AVAILABLE COPY

DCP_0957.JPG Unknown

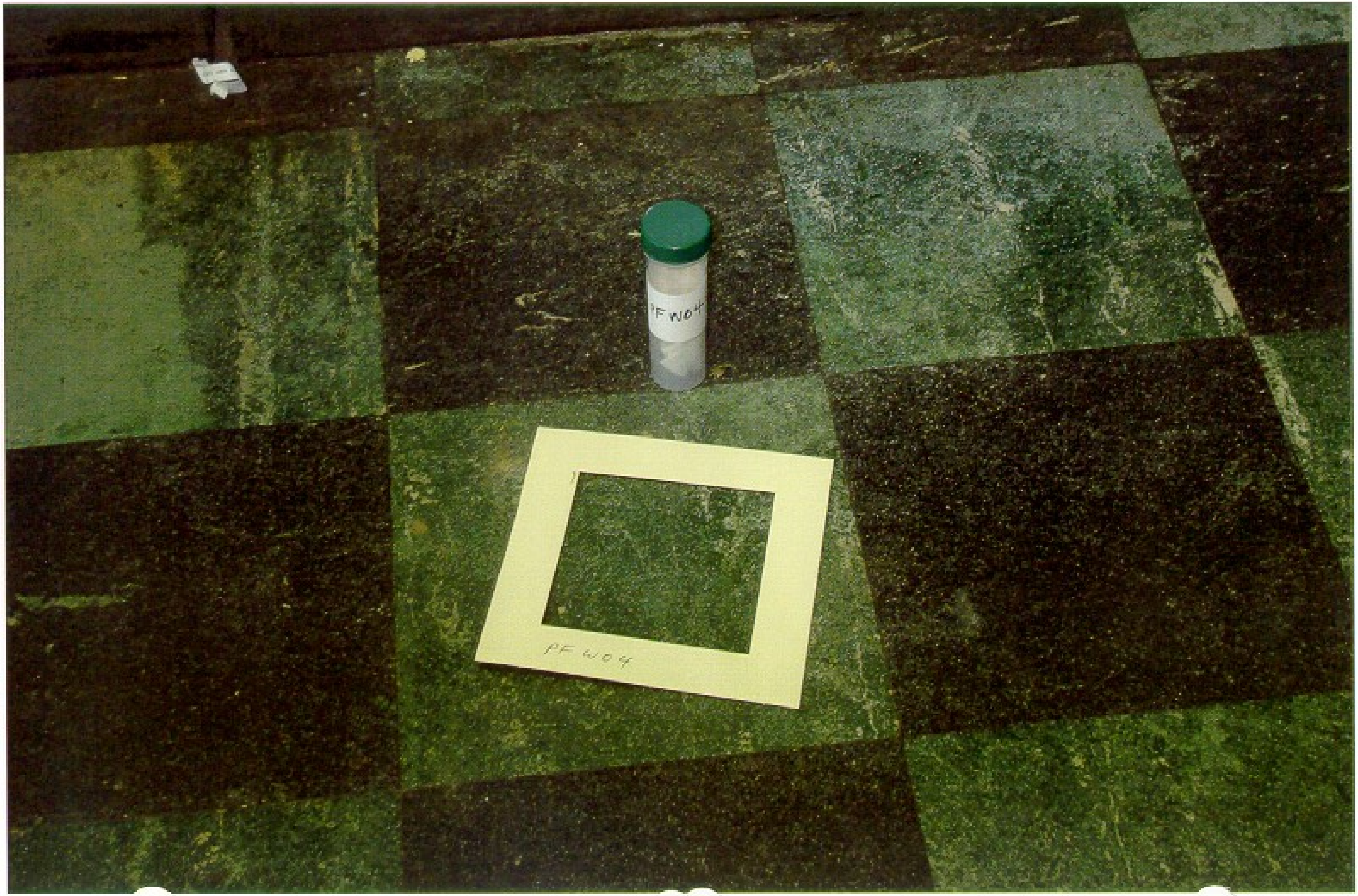
BEST AVAILABLE COPY



DCP_0958.JPG Unknown

BEST AVAILABLE COPY

DCP_0959.JPG Unknown

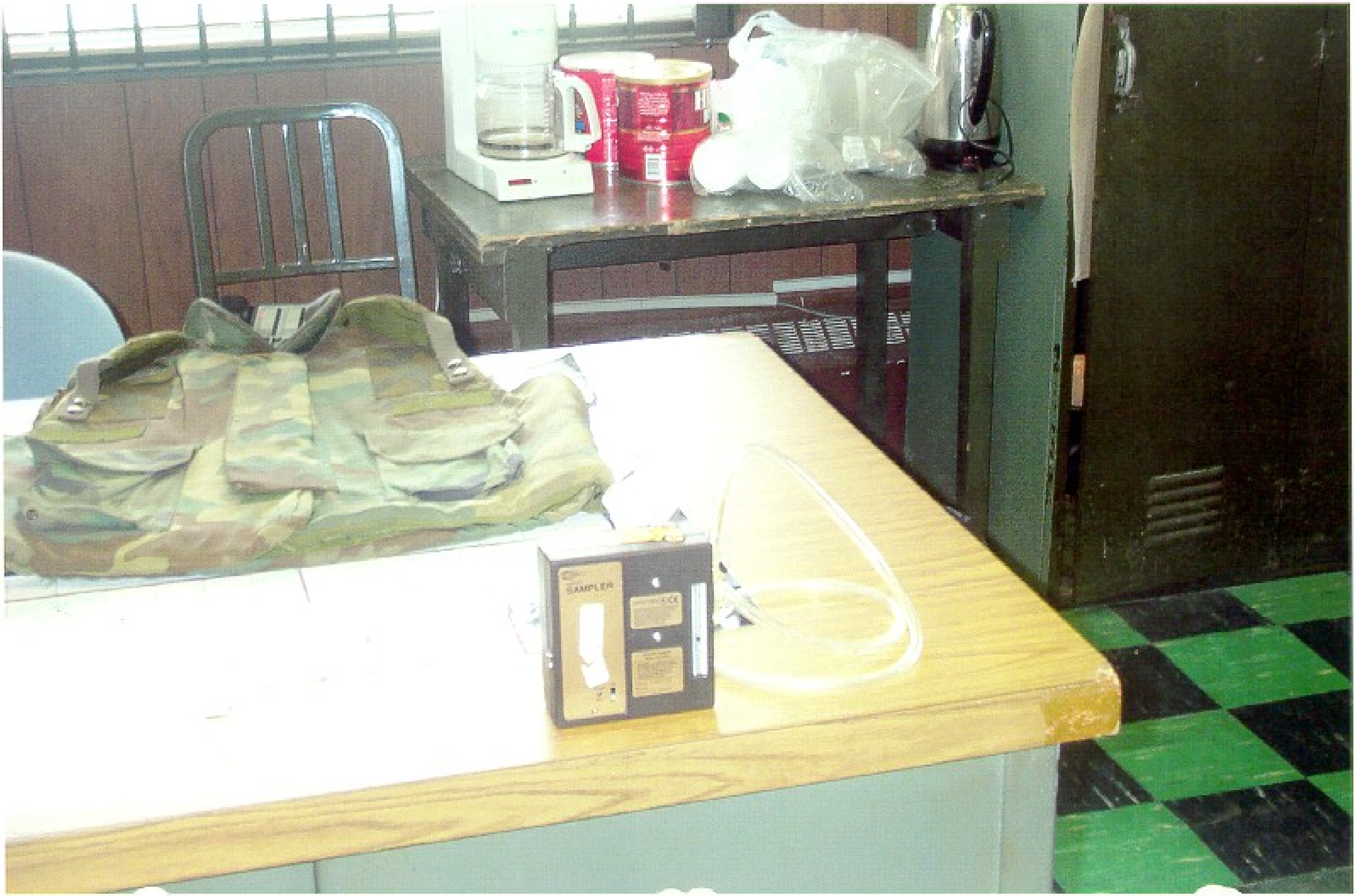


DCP_0960.JPG Unknown

BEST AVAILABLE COPY

DCP_0961.JPG Unknown

BEST AVAILABLE COPY

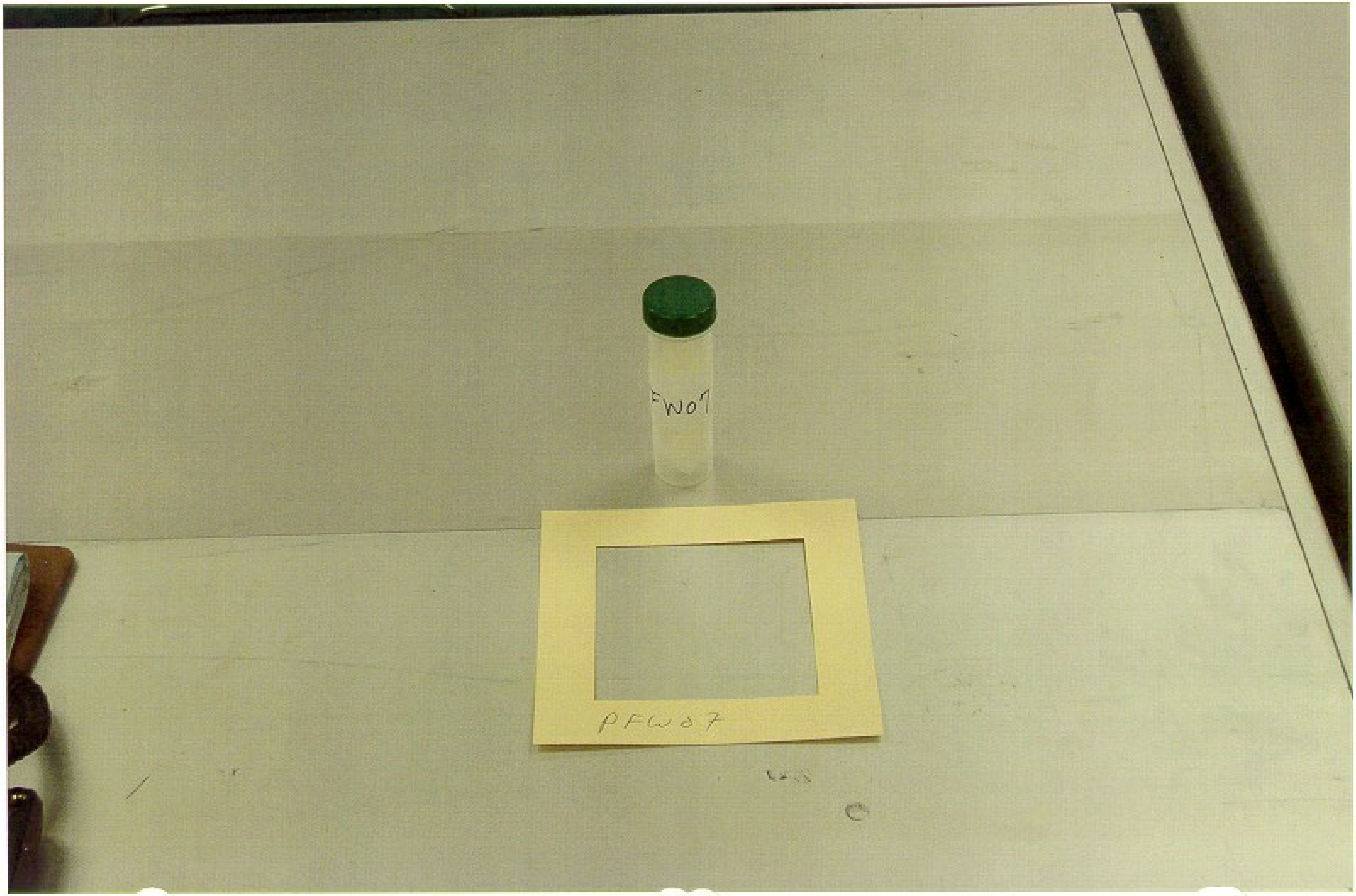


DCP_0962.JPG Unknown

BEST AVAILABLE COPY

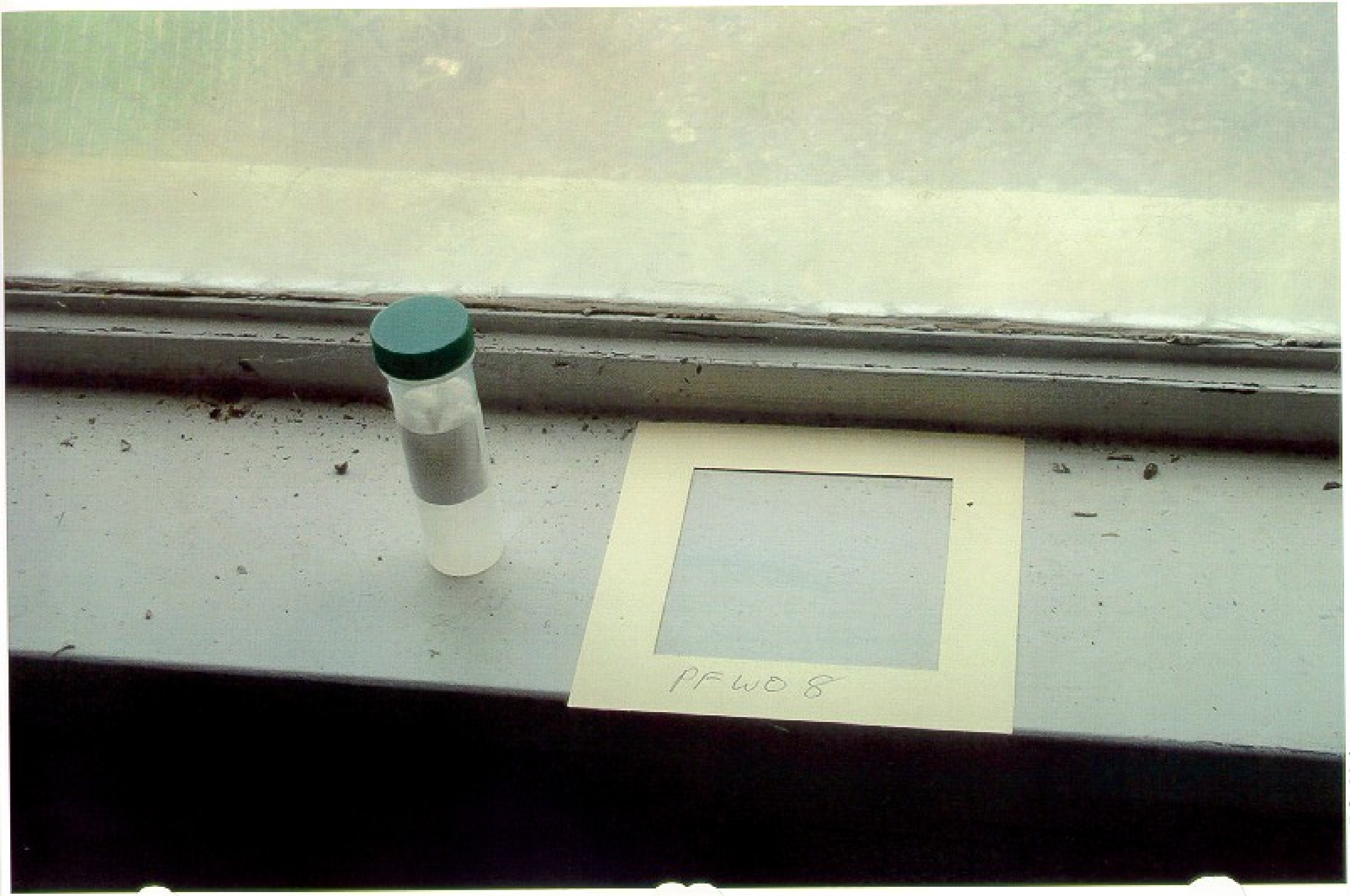
DCP_0963.JPG Unknown

BEST AVAILABLE COPY



DCP_0964.JPG Unknown

BEST AVAILABLE COPY



DCP_0965.JPG Unknown

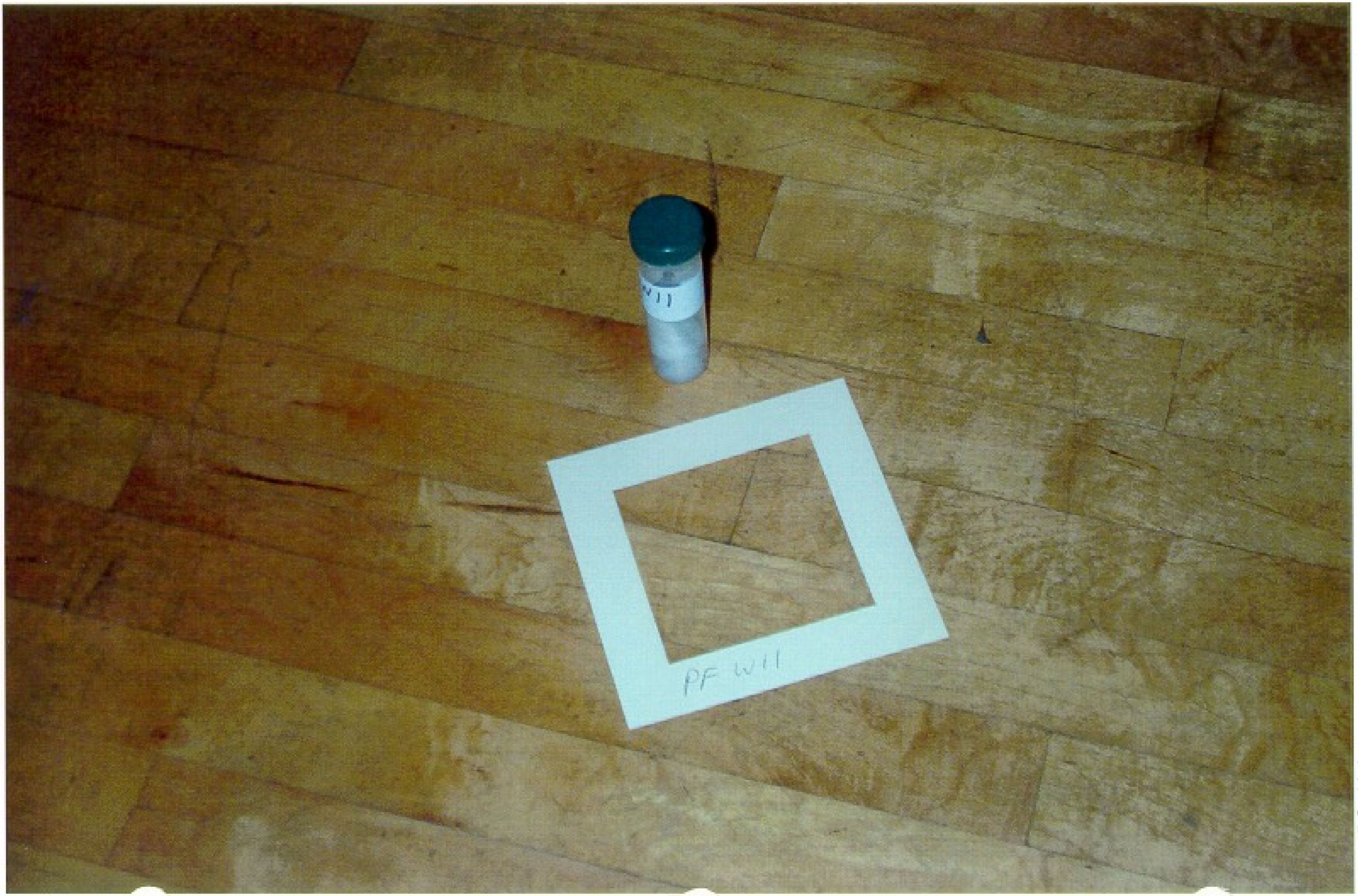
BEST AVAILABLE COPY

DCP_0966.JPG Unknown

BEST AVAILABLE COPY

DCP_0967.JPG Unknown

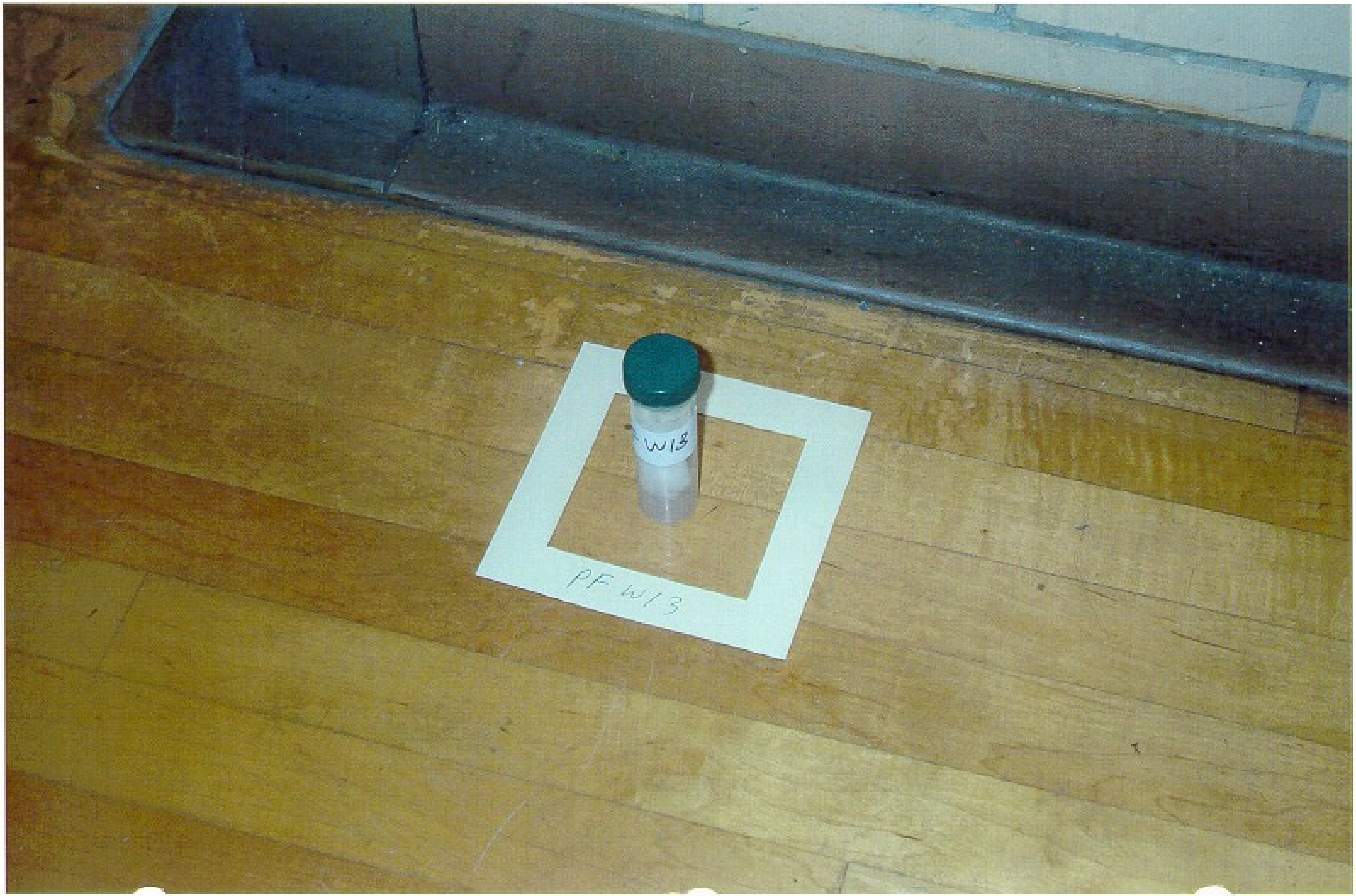
BEST AVAILABLE COPY



DCP_0968.JPG Unknown

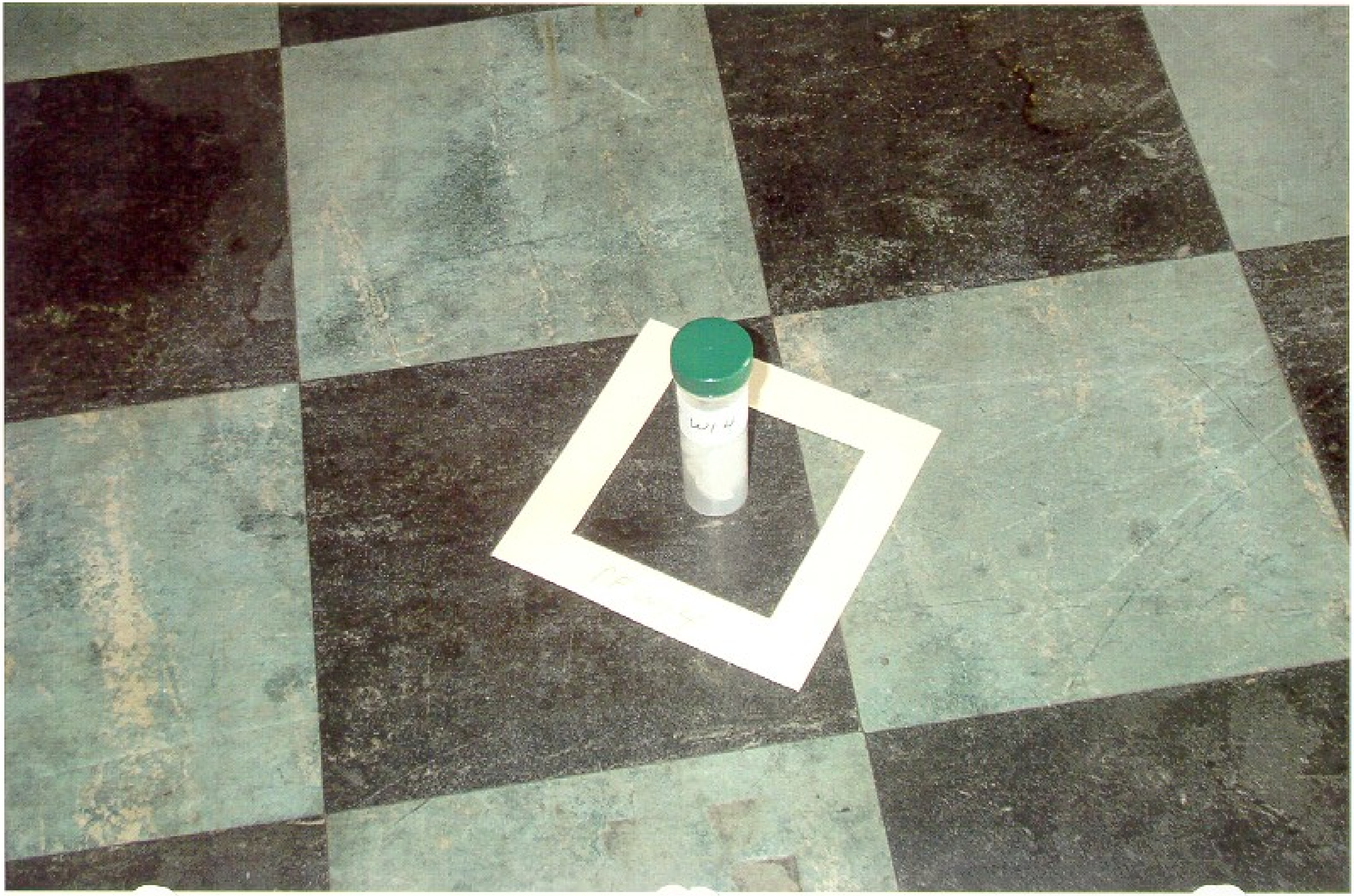
BEST AVAILABLE COPY

DCP_0969.JPG Unknown



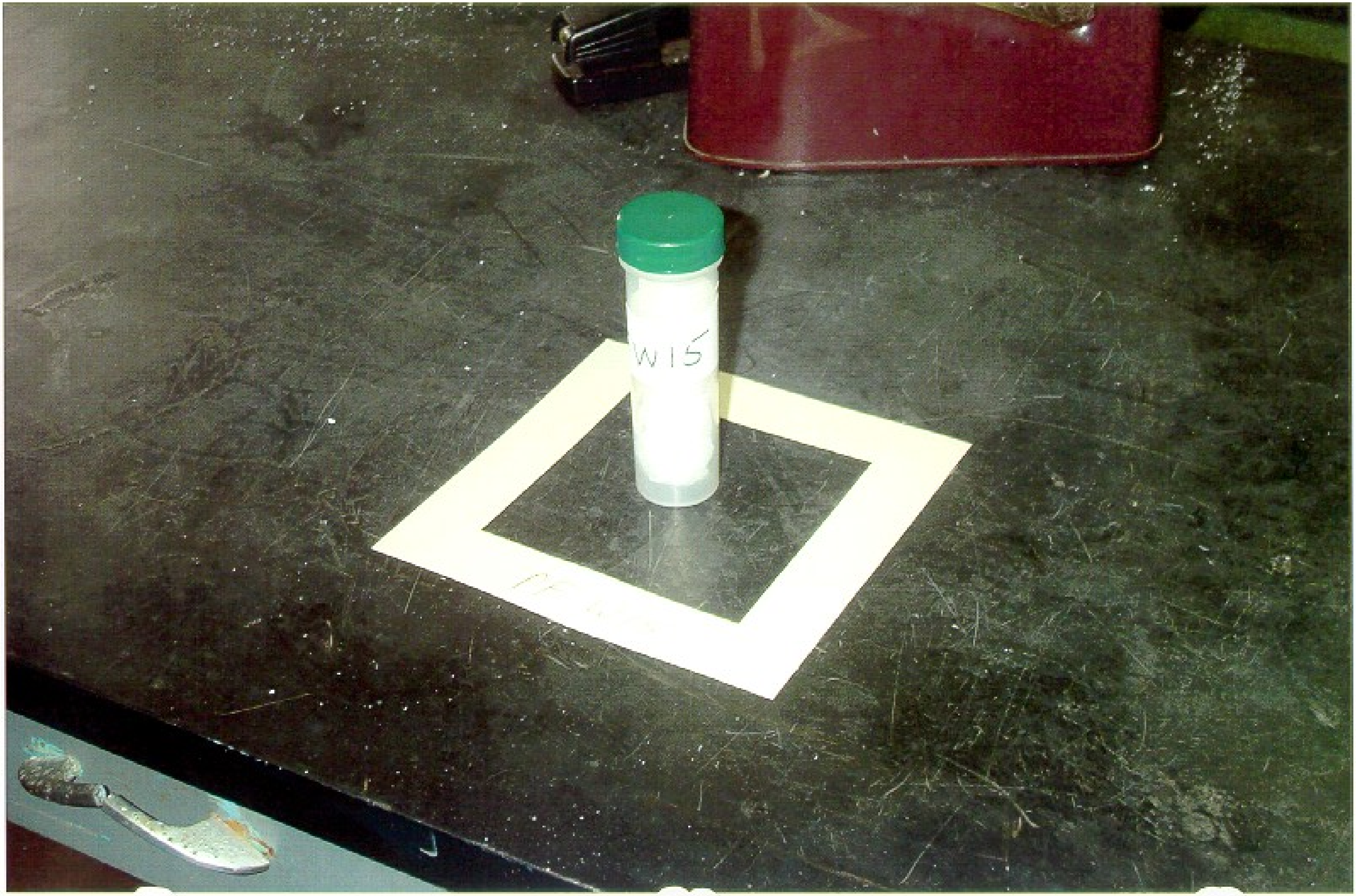
DCP_0970.JPG Unknown

BEST AVAILABLE COPY



DCP_0971.JPG Unknown

BEST AVAILABLE COPY



DCP_0972.JPG Unknown

BEST AVAILABLE COPY

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

APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

BEST AVAILABLE COPY

			Indoor Range Info						
Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Floor	Conc. (µg/ft²)
				Yes		Yes			
PF W01	Prince Frederick	Prince Frederick					Lounge/Training Rm (#104), Bar top	First	<2.8
PF W02	Prince Frederick	Prince Frederick					Lounge/Training Rm (#104), Floor by window and display	First	<2.8
PF W03	Prince Frederick	Prince Frederick					First Sergeants Office (#114), Table top	First	<2.8
PF W04	Prince Frederick	Prince Frederick					Operations Office, Floor far end by desk	First	4.1
PF W05	Prince Frederick	Prince Frederick					Supply, Floor by desks	First	4.3
PF W06	Prince Frederick	Prince Frederick					Former Range Room #1, open window sill between room and drill area	First	6.6
PF W07	Prince Frederick	Prince Frederick					Former Range Room #2, table top	First	<2.8
PF W08	Prince Frederick	Prince Frederick					Former Range Room #3, window sill	First	110
PF W09	Prince Frederick	Prince Frederick					Kitchen, table (counter) top	First	14
PF W10	Prince Frederick	Prince Frederick					Vehicle Maintenance Shop/Bay, floor (under amnesty box)	First	240
PF W11	Prince Frederick	Prince Frederick					Drill Room, Floor, back corner near	First	3.8
PF W12	Prince Frederick	Prince Frederick					Drill Room, Floor, center court	First	3.5
PF W13	Prince Frederick	Prince Frederick					Drill Room, Floor, Corner near door to former range	First	10
PF W14	Prince Frederick	Prince Frederick					Locker and Gym Room, Floor	Second	5.3
PF W15	Prince Frederick	Prince Frederick					Platoon room, desk top	Second	5.7

Table 3, Sampling Locations

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

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

AMA[redacted]alytical Services, Inc.

A Specialized Environmental Laboratory

BEST A[redacted]LE COPY

CERTIFICATE OF ANALYSIS

[redacted]NVLAP
NY ELAP
AIHA

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] Non-Respo
		P.O. Number:	Not Provided	**Report Date:**	17-Sep-03
Attention:	Non-Responsive				

Page 1 of 1

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (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

AMA [illegible]lytical Services, Inc.
A Specialized Environmental Laboratory

BEST A[illegible]PY

CERTIFICATE OF ANALYSIS

NVLAP
NY ELAP
AIHA

Client:	US Army - CHPPM	**Job Name:**	MD Arng/Prince Frederick	**Chain Of Custody:**	117742
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	9/18/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	Non-Responsive
		P.O. Number:	Not Provided	**Report Date:**	22-Sep-03
Attention:	Non-Responsive				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0368043	PF Blank 1	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368044	PF W01	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/ft²	
0368045	PF W02	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/ft²	
0368046	PF W03	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/ft²	
0368047	PF W04	Furnace	Wipe	****	0.108	2.79	ug/ft²		4.1	ug/ft²	
0368048	PF W05	Furnace	Wipe	****	0.108	2.79	ug/ft²		4.3	ug/ft²	
0368049	PF Blank 2	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368050	PF W06	Furnace	Wipe	****	0.108	2.79	ug/ft²		6.6	ug/ft²	
0368051	PF W07	Furnace	Wipe	****	0.108	2.79	ug/ft²	<	2.8	ug/ft²	
0368052	PF W08	Furnace	Wipe	****	0.108	69.70	ug/ft²		110	ug/ft²	
0368053	PF W09	Furnace	Wipe	****	0.108	2.79	ug/ft²		14	ug/ft²	
0368054	PF W10	Furnace	Wipe	****	0.108	139.41	ug/ft²		240	ug/ft²	
0368055	PF Blank 3	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368056	PF W11	Furnace	Wipe	****	0.108	2.79	ug/ft²		3.8	ug/ft²	
0368057	PF W12	Furnace	Wipe	****	0.108	2.79	ug/ft²		3.5	ug/ft²	
0368058	PF W13	Furnace	Wipe	****	0.108	2.79	ug/ft²		10	ug/ft²	
0368059	PF W14	Furnace	Wipe	****	0.108	2.79	ug/ft²		5.3	ug/ft²	
0368060	PF W15	Furnace	Wipe	****	0.108	2.79	ug/ft²		5.7	ug/ft²	
0368061	PF Blank 4	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

BEST AVAILABLE COPY

CERTIFICATE OF ANALYSIS

NVLAP
NY ELAP
AIHA

Client: US Army - CHPPM
Address: Attn: MCHB-TS-OFS, 5158 Blackhawk Road
Aberdeen Proving Grounds, Maryland 21010-5403

Attention: [redacted]

Job Name: MD Arng/Prince Frederick
Job Location: Not Provided
Job Number: Not Provided
P.O. Number: Not Provided

Chain Of Custody: 117742
Date Analyzed: 9/18/2003
Person Submitting: [redacted]
Report Date: 22-Sep-03

Summary of Atomic Absorption Analysis for Lead

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

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

Analyst: G. Edward Carney

Technical Manager: G Edward Carney

BEST AVAILABLE COPY

APPENDIX E

REFERENCES

BEST AVAILABLE COPY

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 Prince Frederick Armory, Prince Frederick, MD
Project No. 55-ML-01ED-03

APPENDIX F

LEAD CLEANING GUIDANCE

BEST AVAILABLE COPY

CHAPTER 14: CLEANING

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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).

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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).

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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.

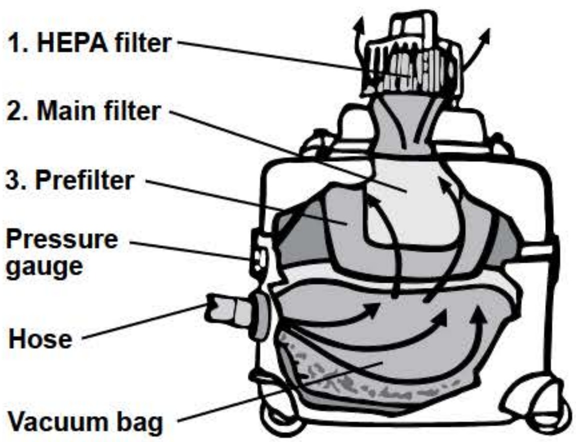
To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture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

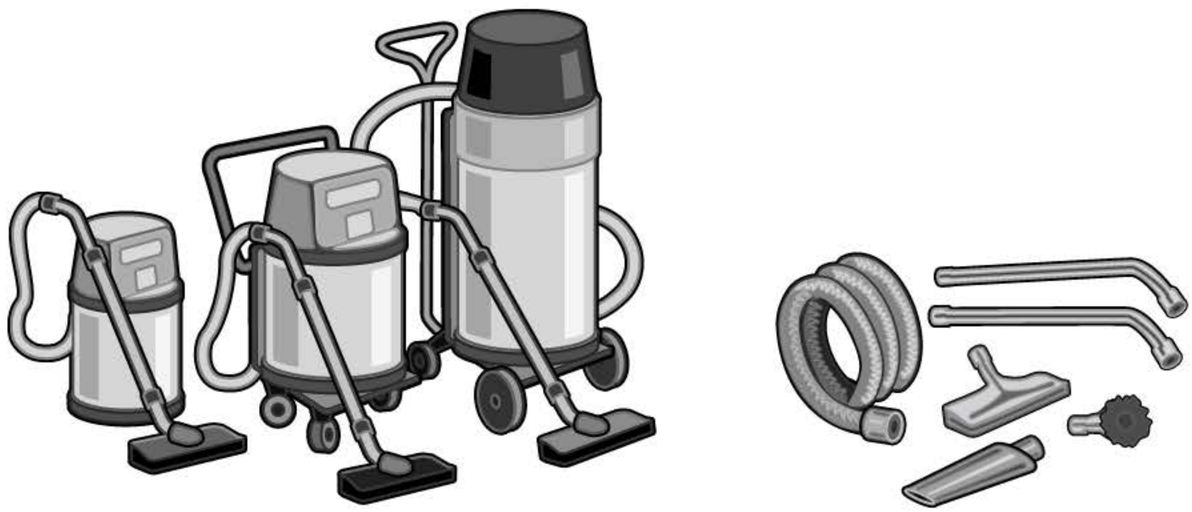
2. Wet Detergent Wash

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.

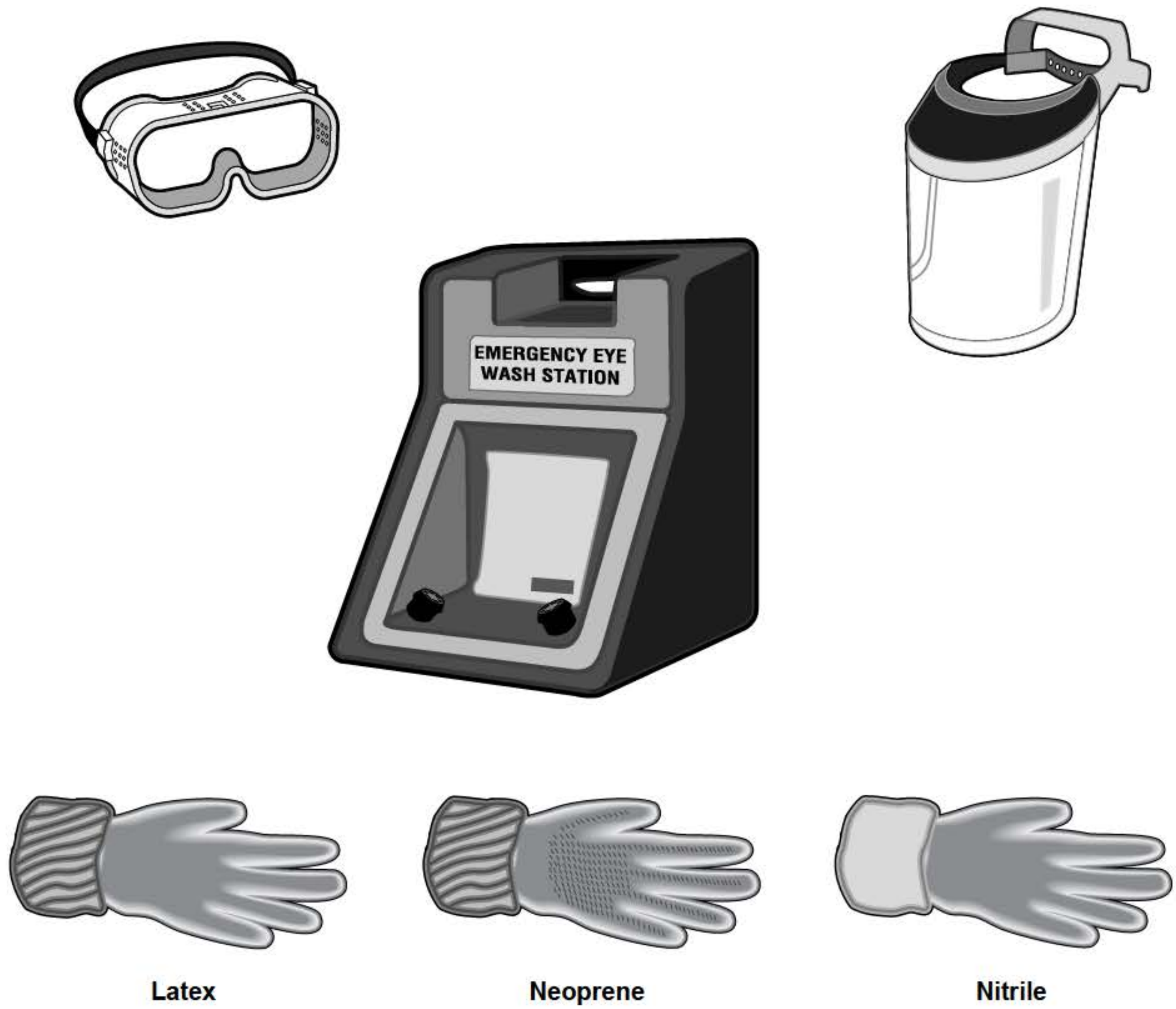
Proper Wet-Cleaning Procedures

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

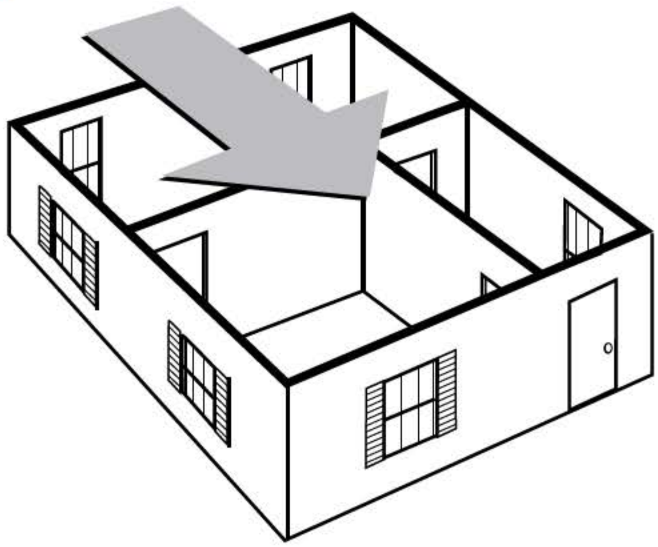
Typical Procedures

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:

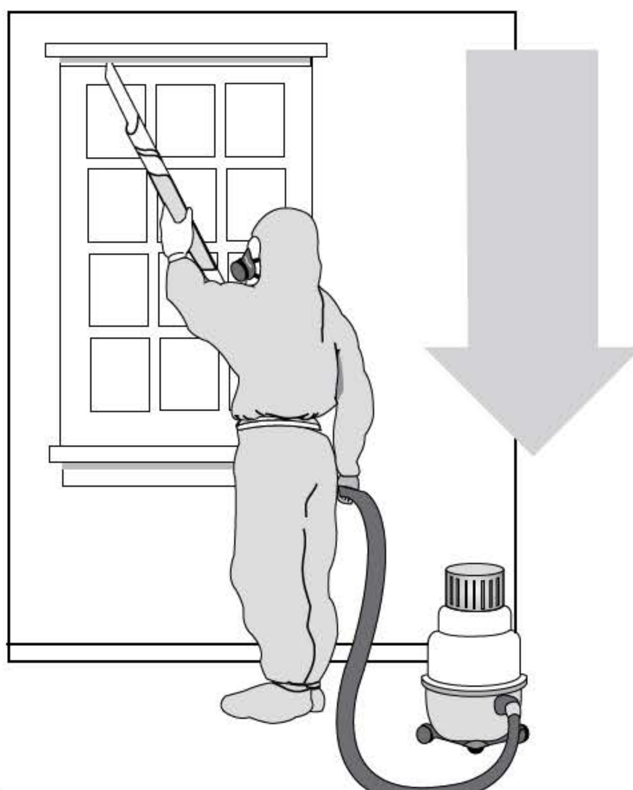
- First, the area is HEPA vacuumed.

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

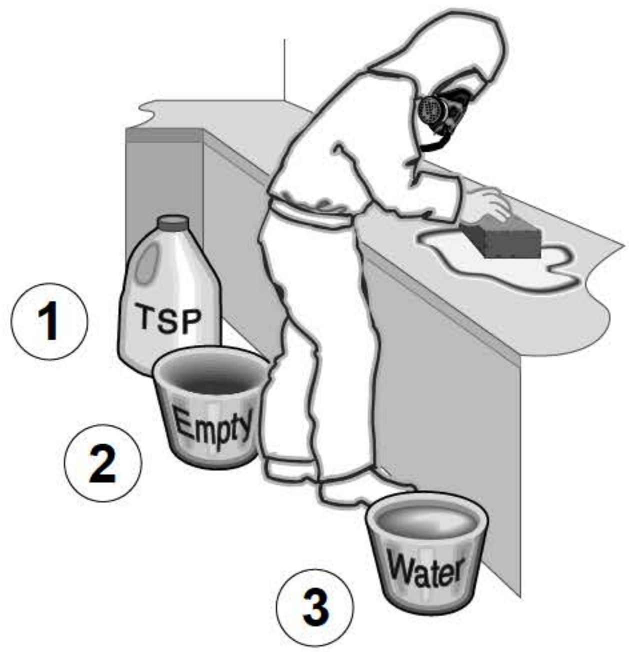
Dust Brush

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

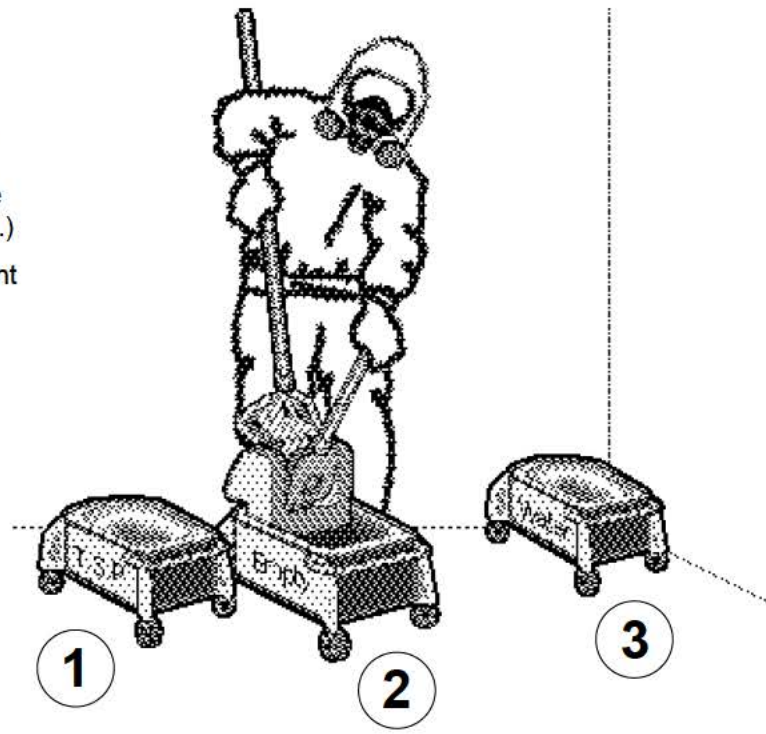
BEST AVAILABLE COPY

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.

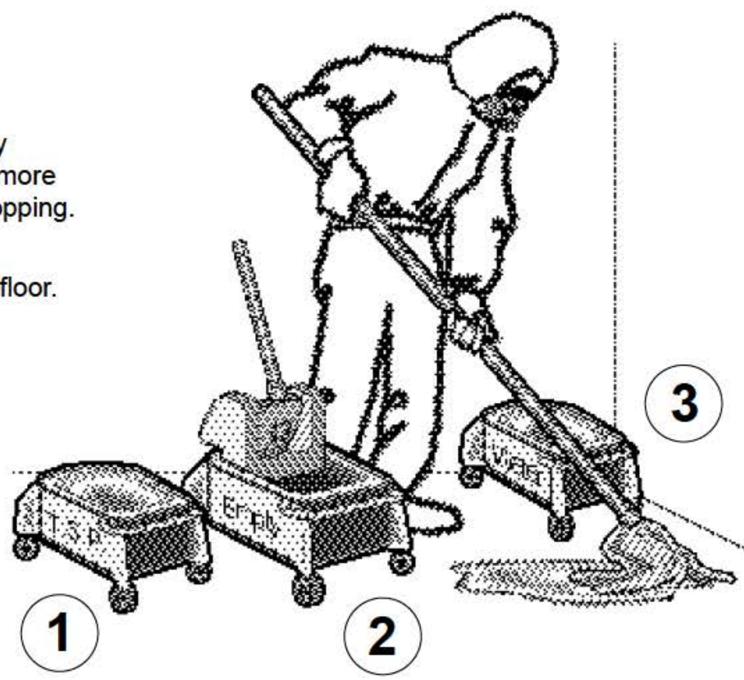
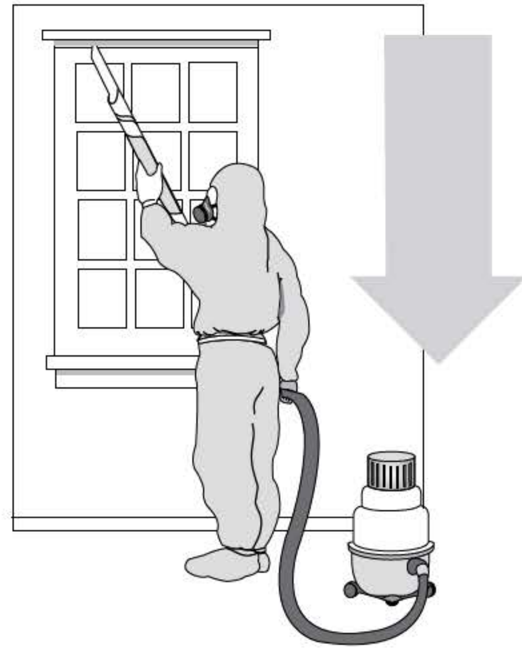


Figure 14.4d (continued)

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.

1. Large Debris

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

2. Small Debris

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

3. Exterior Cleaning

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

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

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

4. Worker Protection Measures

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

5. Maintaining Containment

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

V. Order of Final Cleaning Procedures After Lead Hazard Control

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

A. Final Cleaning

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

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

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

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

1. Decontamination of Workers, Supplies, and Equipment

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

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

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

BEST AVAILABLE COPY

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,

BEST AVAILABLE COPY

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

BEST AVAILABLE COPY

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*

BEST AVAILABLE COPY

APPENDIX G

MOLD GUIDANCE

BEST AVAILABLE COPY

Army Facilities Management Information Document on Mold Remediation Issues

TG 277

FEBRUARY 2002

USACHPPM

Readiness thru Health

BEST AVAILABLE COPY

ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

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.

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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)

BEST AVAILABLE COPY

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).

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

TG 277 February 2002

Local Reproduction is Authorized and Encouraged.

USACHPPM
Readiness thru Health

Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278
February 2002

USACHPPM
Readiness thru Health

BEST AVAILABLE COPY

Table of Contents

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.

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.

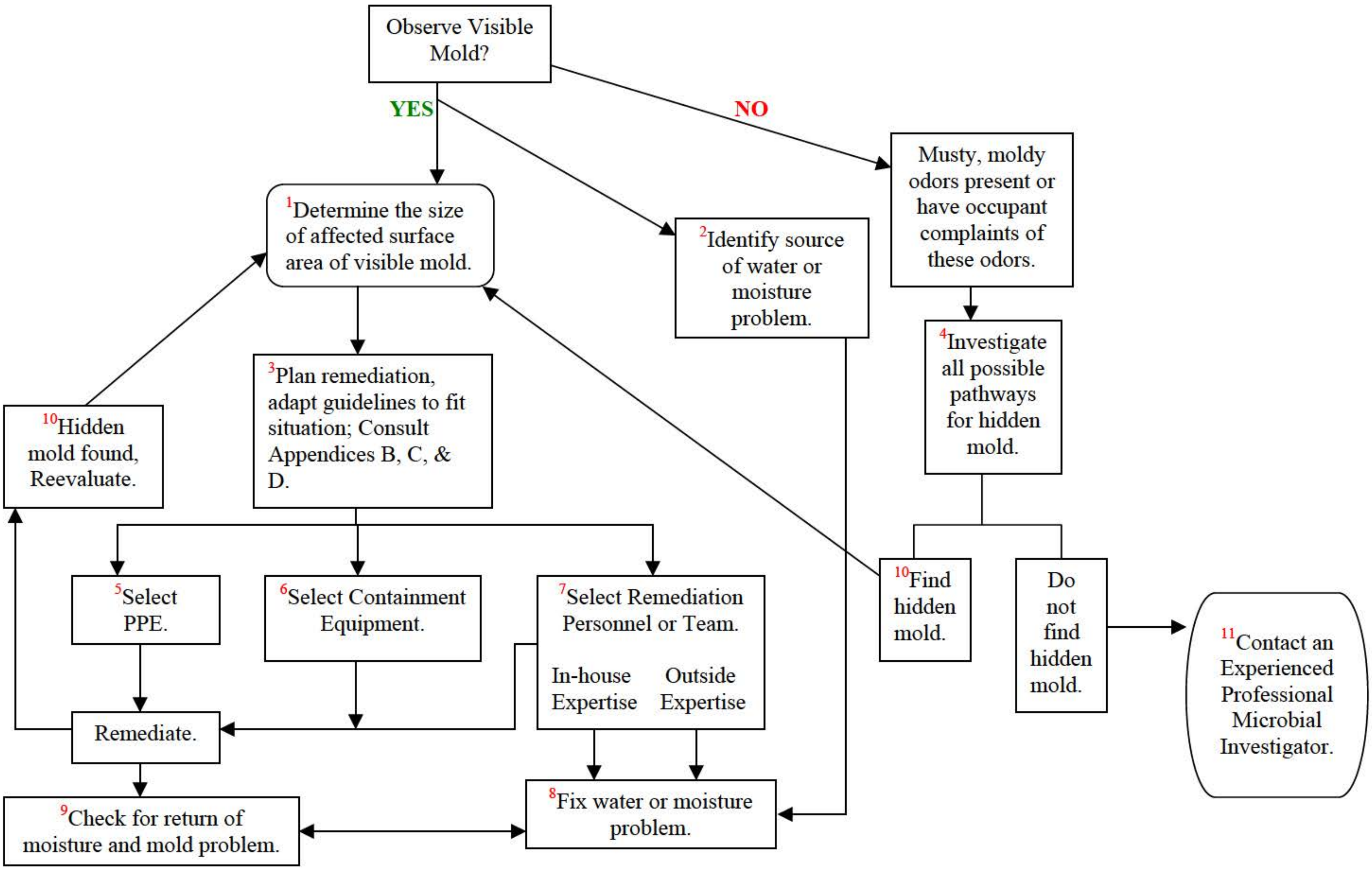
7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

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.

TG 278

February 2002

Local Reproduction is Authorized and Encouraged.

USACHPPM

Readiness thru Health

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
Prince Frederick Readiness Center, Prince Frederick, Maryland 20678
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 Prince Frederick, 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
PRINCE FREDERICK READINESS CENTER
195 ARMORY ROAD, PRINCE FREDERICK, MD 20678
SURVEY DATE: JULY 15, 2008

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

Prepared and submitted by:

Non-Responsive [redacted]

Non-Responsive
Industrial Hygienist

Certified Industrial Hygienist review by:

[redacted]

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

IES ENGINEERS

TABLE OF CONTENTS

TABLES

APPENDIX

IES ENGINEERS

1.0 EXECUTIVE SUMMARY

1.1 Introduction

Assessment Date: July 15, 2008

Purpose: The National Guard Bureau (NGB) retained IES Engineers (IES) to assist it in performing an Industrial Hygiene assessment at the Army National Guard (ARNG) Readiness Center (RC) located at 195 Armory Road in Prince Frederick, Maryland. The purpose of the Industrial Hygiene survey was to identify and measure the existence and extent of potentially hazardous operations or conditions at the ARNG facility. Mr. [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: [redacted], Supervisor, Prince Frederick Readiness Center

1.2 Facility Description

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

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

ENGINEERS

1.3 Findings and Conclusions

The main findings and conclusions of the assessment are:

- On the day of the assessment there were two on-site personnel, one supervisor and one caretaker. During a normal 10-hour day, the supervisor performs logistical work while the caretaker maintains the facility and grounds.

- Airborne lead was not detected in the one personal air sample and one area air sample collected on the day of the assessment. The airborne lead concentrations in each of the air samples were reported at less than 3.4 micrograms of lead per cubic meter of air (µg/m^3), which is well below the OSHA Action Level of 40 µg/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 (µg/ft^2). Additional cleaning using HEPA filtered vacuum systems and/or wet methods is recommended for these areas to help further reduce the potential for personnel exposure to lead.

- The air temperatures within the facility ranged from 71.9°F to 80.2°F, as compared to an outdoor temperature of 82.4°F. Some of the temperatures collected inside the building exceeded what is considered comfortable, as recommended by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). On the day of the assessment, IES was informed that only two individuals routinely occupy the facility and use Rooms 121 and 122, which were within the range suggested by ASHRAE on the day of the assessment. Indoor relative humidity ranged from 59.6% to 62.1% in the facility, as compared to an outdoor level of 66.9%. Most of the relative humidity levels measured in the interior of the building were higher than the generally recognized comfort range of 30 to 60%. Relative humidity levels above 60% are conducive to microbial growth for cellulose-based building materials such as drywall and ceiling tiles.

- The majority of building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. However, IES observed deteriorating paint within the kitchen and boiler room within the facility. IES collected paint chip samples from these areas. IES also collected bulk building materials from the Supervisor's Office (Room 121) and from the kitchen to be analyzed for their asbestos content. No asbestos was detected in either of the bulk samples.

- Gray floor paint within the Boiler Room and Kitchen were identified as lead based (3.9%). Approximately 5 square feet of this paint was damaged in the Kitchen and 10 square feet was damaged in the Boiler Room.

IES ENGINEERS

- Mold growth was identified within the storage area of the Supervisor's Office, above the lockers. Water damage was also identified at entrance to supervisor's office. IES was informed that the water-damaged areas were due to roof leaks. IES was also informed that the roof underwent repair a year before the assessment date.

- Various health and safety items were identified during the comprehensive survey. These include:
  - NFPA sign on the 4,000-gallon fuel storage tank did not contain the appropriate numbering
  - Emergency lighting did not light when tested

1.4 Recommendations

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

IES ENGINEERS

2.0 OPERATION DESCRIPTION

INSTALLATION: RC Army National Guard
BUILDING: 195 Armory Road, Prince Frederick, Maryland 20678
LOCATION: Site wide

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

CHEMICAL AND PHYSICAL AGENTS SAMPLED: Personal and area sampling for lead was performed on the day of the assessment during what is considered routine operations when training is not taking place at the facility. General IAQ measurements were made throughout the facility to evaluate ambient conditions on the day of the assessment.

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

LIGHTING: The average illuminance levels in several areas throughout the shop were below the recommended values. Refer to Section 3.3 of this report for a summary of the lighting measurements.

INTERPRETATION OF RESULTS: The personal and area lead sample results suggest that the likelihood of personnel exposure to airborne lead dust is low. Wipe samples for lead that were collected from various horizontal surfaces throughout the Readiness Center indicated that the surface lead concentrations in certain areas exceeded the recommended precautionary level of 200 $\mu g/ft^2$. Although there is limited correlation between surface lead contamination and airborne lead exposures, it is recommended that the affected areas be thoroughly cleaned using HEPA filtered vacuum systems and/or wet methods. The average illuminance levels in several areas throughout the facility were below the recommended values. Although the lower-than-recommended lighting levels are not expected to present an imminent hazard, safety and ergonomic improvements could result from enhanced lighting in these areas. Deteriorating paint was observed within the kitchen and boiler room within the facility. Approximately 15 sqaure feet (total) of Lead based paint is damaged on the floor of the Boiler Room and Kitchen. Bulk samples collected from building materials from the Supervisor's Office (Room 121) and from the kitchen indicated no asbsestos. Mold growth was identified within the storage area of the Supervisor's Office, above the lockers. Water damage at entrance to supervisor's office due to previous roof leaks. Temperature and relative humidity were higher than the recommended levels for comfort on the day of the assessment.

3.0 SAMPLE RESULTS AND MEASUREMENTS

3.1 Air Sampling

3.1.1 Indoor Air Quality

Measurements of air temperature, relative humidity, and 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 15, 2008
Location: National Guard RC, Prince Frederick, 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	**Room 121** - Area Sample (AS) – Approximately four feet above the ground at the center of Room 121.	1110 – 1114	4 Min.	**536**	**0**	**71.9**	**60.5**
B	**Room 118** – AS – Approximately four feet above the floor at the center of the Orderly Office.	1114 – 1118	4 Min.	**571**	**0**	**80.2**	**59.6**
C	**Room 114** – AS – Approximately four feet above the floor at the center of the 1SG Office.	1118 – 1122	4 Min.	**589**	**0**	**79.5**	**60.4**
D	**108** – AS – Approximately four feet above the floor at the center of the lobby.	1122 – 1126	4 Min.	**606**	**0**	**79.6**	**60.4**

ENGINEERS

Sample ID	Sample Description	Start - End Time (hh:mm)	Sample Time	CO_2 (ppm)	CO (ppm)	Measured Temperature (°F)	Measured Relative Humidity (%)
E	**Room 107** – AS – Approximately four feet above the floor at the center of the EM Lounge	1126 – 1130	4 Min.	723	0	79.5	60.6
F	101 – AS – Approximately four feet above the floor at the center of the Drill Hall.	1130 – 1134	4 Min.	645	0	79.5	60.8
G	122 – AS – Approximately four feet above the floor in the former rifle range.	1134– 1138	4 Min.	682	0	75.6	62.1
H	**Maintenance** – AS – Approximately four feet above the floor at the center of [redacted] Office.	1138 – 1142	4 Min.	600	0	75.6	62.1
I	122 – AS – Approximately four feet above the floor in the former rifle range.	1142 – 1146	4 Min.	622	0	75.6	62.1
J	**Outdoor** – AS – Approximately four feet above the ground outside of the RC.	1146 - 1150	4 Min.	349	0	82.4	66.9

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

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

3.1.2 Airborne Lead Sampling

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

Air sample results for lead were compared to the Action Level and Permissible Exposure Limits (PELs) published in OSHA 1910.1025, the expanded health standard for lead. Action Levels and PELs are promulgated through the OSHA rule-making process and act as legal limits for exposure in the work place. They are intended to provide protection to employees who are potentially exposed to airborne contaminants. The Action Level for lead is expressed in terms of an 8-hour time-weighted average (TWA) contaminant concentration. The PEL for lead is expressed in terms of 8-hour TWA. Copies of the OSHA regulations are available through the local OSHA Area Office, in the Federal Register, or on the OSHA website at *www.osha.gov*. (4)

This report's findings are based on the lead samples collected during the assessment, which are summarized in Table 2. Refer to Appendix C for the complete laboratory air sample analysis results. Worksite Sampling Data Records are included in a separate document entitled, "Prince Frederick_RC_08_Medical."

TABLE 2
AIRBORNE LEAD SAMPLING RESULTS SUMMARY

Date of Monitoring: July 15, 2008
Location: Army National Guard RC, Prince Frederick, Maryland
Analyte(s): Lead
Occupational Exposure Limits: Lead: OSHA PEL-TWA = 50 µg/m^3
OSHA Action Level (TWA) = 30 µg/m^3

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

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

3.2 Lead Dust Sampling

IES performed wipe sampling in the Drill Hall, converted rifle range and in select areas throughout the facility. All wipe sampling was performed in accordance with: best Industrial Hygiene practices and the guidelines published in Section II: Chapter 2, Sampling for Surface Contamination, of the OSHA Technical Manual. The wipe samples were collected over 100 square centimeter areas using pre-wetted Ghost Wipes. The wipe samples collected as a part of this assessment, along with appropriate field blanks, were shipped to AMA for analysis and were analyzed using the NIOSH 7082 flame atomic absorption spectrophotometer (FAAS) method. All wipe sample results were reported in micrograms of lead per square foot of surface sampled (µg/ft^2) for the purposes of this assessment.

This report's findings are based on the lead samples collected during the assessment, which are summarized in Table 3. Refer to Appendix D for sample locations and Appendix C for the complete laboratory wipe sample analysis results. Worksite Sampling Data Records are included in a separate document entitled, "Prince Frederick_RC_08_Medical."

IES ENGINEERS

TABLE 3 – WIPE SAMPLE RESULTS SUMMARY

Date of Monitoring: July 15, 2008
Location: Army National Guard RC, Prince Frederick, Maryland
Analyte(s): Lead
Occupational Exposure Limits: ARNG Recommends Cleaning = 200 µg/ft^2

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

3.3 Illuminance Survey

The illumination survey was performed pursuant to best Industrial Hygiene practices and the guidelines found in the ARNG document entitled, "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," dated November 17, 2007.[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.

IES ENGINEERS

TABLE 4
ILLUMINANCE READINGS SUMMARY

Survey Dates: July 15, 2008
Location: Army National Guard RC, Prince Frederick, Maryland

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

Notes: - All illuminance measurements and recommended values are expressed in foot candles (fc)

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

4.0 ONSITE OBSERVATIONS

A copy of IES' field notes from this assessment is included in a separate document entitled, "RC_3_08_Field_Notes."

4.1 Physical Condition of RC

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

IES ENGINEERS

4.1.1 Deteriorating Paint Chip Sampling

IES performed a visual inspection of the building materials and observed deteriorating paint throughout the shop. IES collected three paint chip samples of various colors and substrates. The paint chip samples were shipped via overnight courier to AMA. The sample was analyzed for lead content using the EPA 600 flame atomic absorption method. All sample results were reported in percent lead for the purposes of this assessment. Lead-based paint is considered any paint or surface coating that contains lead equal to or exceeding one milligram per square centimeter (mg/cm^2) or is 0.5% lead by weight

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

TABLE 5
PAINT CHIP SAMPLING SUMMARY

Date of Assessment: July 15, 2008
Location: Army National Guard RC, Prince Frederick, Maryland

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

4.1.2 Asbestos-Containing Materials Sampling

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

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

TABLE 6
ASBESTOS CONTAINING MATERIALS SAMPLING SUMMARY

Date of Assessment: July 15, 2008
Location: Army National Guard RC, Prince Frederick, Maryland

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

Notes: - NAD = No Asbestos Detected

4.2 Housekeeping

Housekeeping within the facility was generally good. IES observed no imminent slip, trip and fall hazards on the day of the assessment. All furniture within the offices and training areas were properly maintained within the rooms.

5.0 EQUIPMENT AND CALIBRATION DATA

5.1 Sampling Equipment List

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

TABLE 7
SAMPLING EQUIPMENT LIST

Equipment Type	Make/Model	Equipment/Serial Number	Equipment Identification
Personal Sampling Pump	MSA Escort ELF	110	110
Personal Sampling Pump	MSA Escort ELF	103	103
Primary Gas Flow Calibrator (Electronic Frictionless Piston)	Bios DryCal DC-Lite Model DCL-HM; S/N 101785	DryCal-ML	DryCal-ML
Light Meter	Extech Light Meter	401025	401025
Indoor Air Quality Monitor	TSI Model 8551 Q-Trak	51885	Q-Trak

5.2 Sampling Equipment Calibration Data

Table 8 details the calibration data for each piece of sampling equipment used during the assessment.

TABLE 8
SAMPLING EQUIPMENT CALIBRATION DATA

Equipment ID	Calibrator Used	Date of Pre-Sampling Calibration	Pre-Sampling Calibration Value (lpm)	Date of Post-Sampling Calibration	Post-Sampling Calibration Value (lpm)	Average Calibration Value (lpm)
110	DryCal-ML	7/15/08	2.01	7/15/08	2.01	2.01
103	DryCal-ML	7/15/08	1.99	7/15/08	1.99	1.99
DryCal-ML	Bench Calibrated 02/07/08	N/A	N/A	N/A	N/A	N/A
401025	NA	NA	NA	NA	NA	NA
Q-Trak	Zero Gas/ Span Gas	7/15/08	Zero Gas: 0 ppm CO_2; 0 ppm CO Span Gas 1,000 ppm CO_2; 35 ppm CO	7/15/08	Zero Gas: 0 ppm CO_2; 0 ppm CO Span Gas 1,000 ppm CO_2; 35 ppm CO	Zero Gas: 0 ppm CO_2; 0 ppm CO Span Gas 1,000 ppm CO_2; 35 ppm CO

6.0 REFERENCES

1. ACGIH, *2008 TLVs and BEIs*.
2. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), Standard 62.1-2007, "Ventilation for Acceptable Indoor Air Quality," ASHRAE, Atlanta, Georgia, 2004.
3. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), Standard 55-2004, "Thermal Environmental Conditions for Human Occupancy," ASHRAE, Atlanta, Georgia, 2004.
4. Occupational Safety and Health Administration, 29 CFR 1910.1025, Lead.
5. Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," ARNG, 17 November 2007.

ENGINEERS

APPENDIX A

FACILITY PHOTOGRAPHS

IES ENGINEERS

Photograph #1 – RC Exterior

Photograph #2 – Assembly Hall

Photograph #3 – RC Kitchen

Photograph #4 – Converted Rifle Range

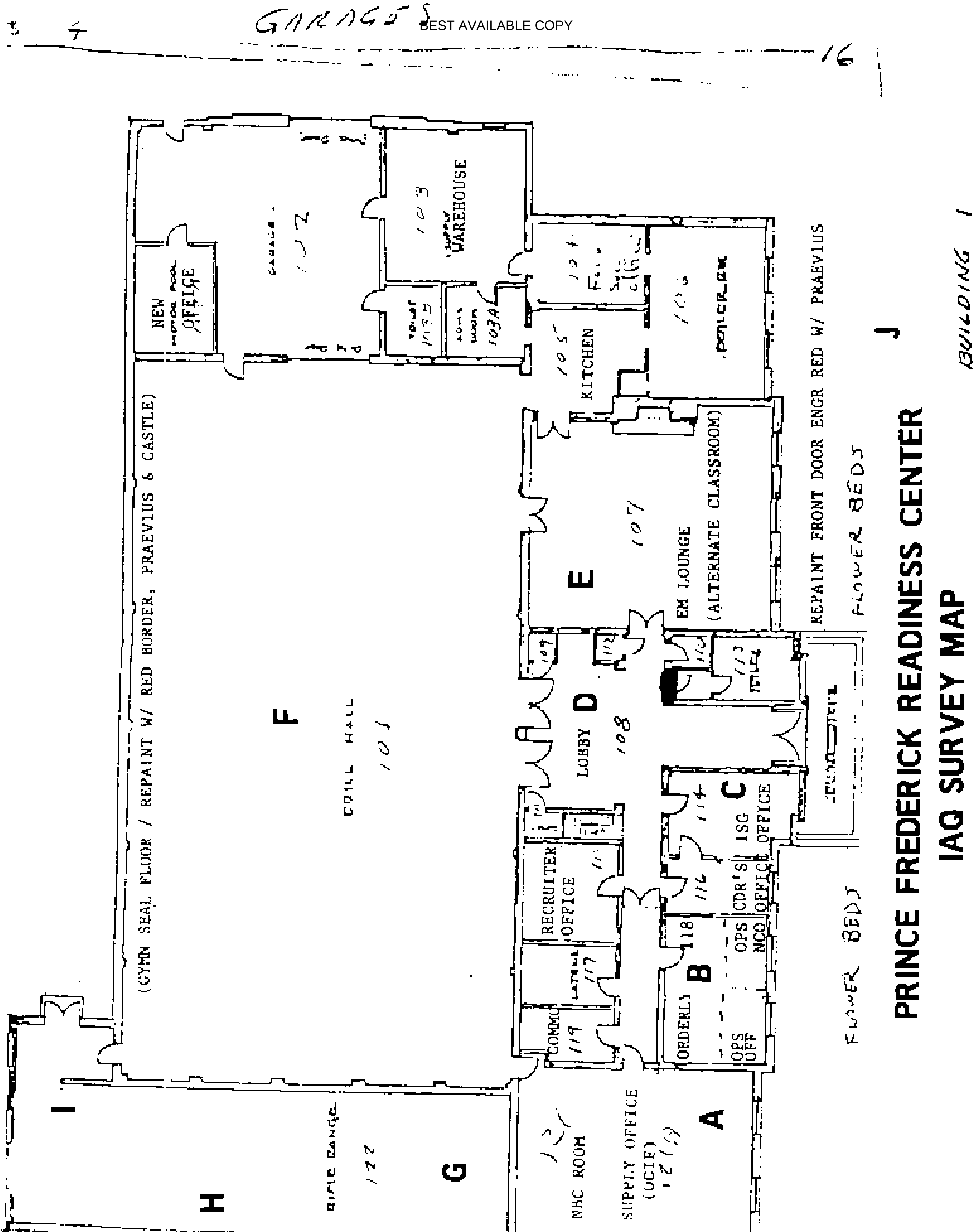
Photograph #5 – Visible Mold in Supervisor's Office

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

APPENDIX B

INDOOR AIR QUALITY SAMPLE LOCATION MAP

BEST AVAILABLE COPY



APPENDIX C

AIR, WIPE, AND PAINT CHIP SAMPLING RESULTS

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:**	Not Provided	**Chain Of Custody:**	159372
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Prince Frederick, MD	**Date Submitted:**	7/22/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EHS08794.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	7/24/2008
				Report Date:	7/24/2008

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
0871070	071508-SW001	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871071	071508-SW002	Flame	Wipe	****	0.108	111.52	ug/ft²		650	ug/ft²	
0871072	071508-SW003	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871073	071508-SW004	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871074	071508-SW005	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871075	071508-SW006	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871076	071508-SW007	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871077	071508-SW008	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871078	071508-SW009	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871079	071508-SW010	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871080	071508-SW011	Flame	Wipe	****	0.108	111.52	ug/ft²		230	ug/ft²	
0871081	071508-SW012	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871082	071508-SW013	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871083	071508-SW014	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0871084	071508-SW015	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0871085	071508-A001	Flame	Air	876	N/A	3.42	ug/m³	<	3.4	ug/m³	
0871086	071508-A002	Flame	Air	884	N/A	3.39	ug/m³	<	3.4	ug/m³	
0871087	071508-A003	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	
0871088	LBP-001	Flame	Paint Chip	****	N/A	0.01	%Pb		0.38	%Pb	

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

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA Accredited Laboratory, Environmental Lead, 100470
NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Not Provided	**Chain Of Custody:**	159372
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Prince Frederick, MD	**Date Submitted:**	7/22/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EHS08794.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	7/24/2008
				Report Date:	7/24/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Final Result	Comments
0871089	LBP-002	Flame	Paint Chip	****	N/A	0.01 %Pb	0.048 %Pb	
0871090	LBP-003	Flame	Paint Chip	****	N/A	0.01 %Pb	3.9 %Pb	

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

BEST AVAILABLE COPY

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

* Bill National Guard Bureau Region North 1H office Directly

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 159372

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: ~~Site~~ Prince Frederick, MD
3. Job #: EHS08 794.02 [redacted] P.O. #:
4. Contact Person: [redacted]
5. Submitted by: [redacted] Signature: [redacted]

☐ Please include COC/field data sheets with results
Date & Time Results Required: 7/29/08 @ 700
Reporting Information (Results will be provided as soon as technically feasible): ☐ Immd. ☐ 24hr ☐ 48hr ☐ 72hr ☒ 5 Day + ☐ Immd. After-Hours* ☐ 24hr After [redacted] -Night* (*must be pre-scheduled)
☐ Verbals: ______ @ cell # ______ ☐ Fax Copy: ______ @ fax # ______ ☒ Email Copy [redacted] @ iesengineers.com

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 ghostwipe) 15 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid ____ (QTY)
☐ TCLP ____ (QTY)
☐ Drinking Water ____ (QTY)
☐ Waste Water ____ (QTY)
☐ Dust Wipe Furnace (wipe type ____) ____ (QTY)

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
071508-SW001		7/15/08		100in^2				X								X	Date/Time: Contact: By:
071508-SW002				100in^2				X								X	
071508-SW003				100in^2				X								X	
071508-SW004				100in^2				X								X	
071508-SW005				100in^2				X								X	Date/Time: Contact: By:
071508-SW006				100in^2				X								X	
071508-SW007				100in^2				X								X	
071508-SW008				100in^2				X								X	
071508-SW009				100in^2				X								X	Date/Time: Contact: By:
071508-SW010				100in^2				X								X	
071508-SW011				100in^2				X								X	
071508-SW012				100in^2				X								X	
071508-SW013				100in^2				X								X	

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 7 /22 /08 @0955 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:

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

* Bill National Guard Bureau Region North IH office Directly

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 159371

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: Prince Frederick, MD
3. Job #: EH508794.02 P.O. #:
4. Contact Pers[redacted]
5. Submitted by[redacted] Signature: [redacted]

❑ Please include COC/field data sheets with results

Reporting Information (Results will be provided as soon as technically feasible):
Date & Time Results Required: ___/___/___ @ ____ ☐Immd. ☐24hr ☐48hr ☐72hr ☐5 Day + ☐Immd. After-Hours* ☐24hr After-Hours* ☐Late-Night* (*must be pre-scheduled)

❑ Verbals: ____ @ cell # ____ ❑ Fax Copy: ____ @ fax # ____ ☒ Email Copy [redacted] @ iesengineers.com

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
❑ NIOSH 7400____(QTY)
❑ Fiberglass____(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
❑ AHERA____(QTY)
❑ NIOSH 7402____(QTY)
❑ Other (specify____)____(QTY)
PLM Bulk
❑ EPA 600 – Visual Estimate____(QTY)
❑ EPA Point Count____(QTY)
❑ NY State Friable 198.1____(QTY)
❑ Grav. Reduction ELAP 198.6____(QTY)
❑ Other (specify____)____(QTY)

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

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

Lead Analysis
❑ Paint Chip____(QTY)
☒ Dust Wipe (wipe type ghost wipe) 15 (QTY)
☒ Air 3 (QTY)
❑ Soil/Solid____(QTY)
❑ TCLP____(QTY)
❑ Drinking Water____(QTY)
❑ Waste Water____(QTY)
❑ Dust Wipe Furnace (wipe type____)____(QTY)

Mold - Direct Microscopic Analysis
❑ Spore-Trap____(QTY) ❑ Bulk____(QTY)
❑ Surface Swab____(QTY) ❑ Surface Vacuum Dust____(QTY)
❑ Surface Tape____(QTY) ❑ Other (Specify____)____(QTY)

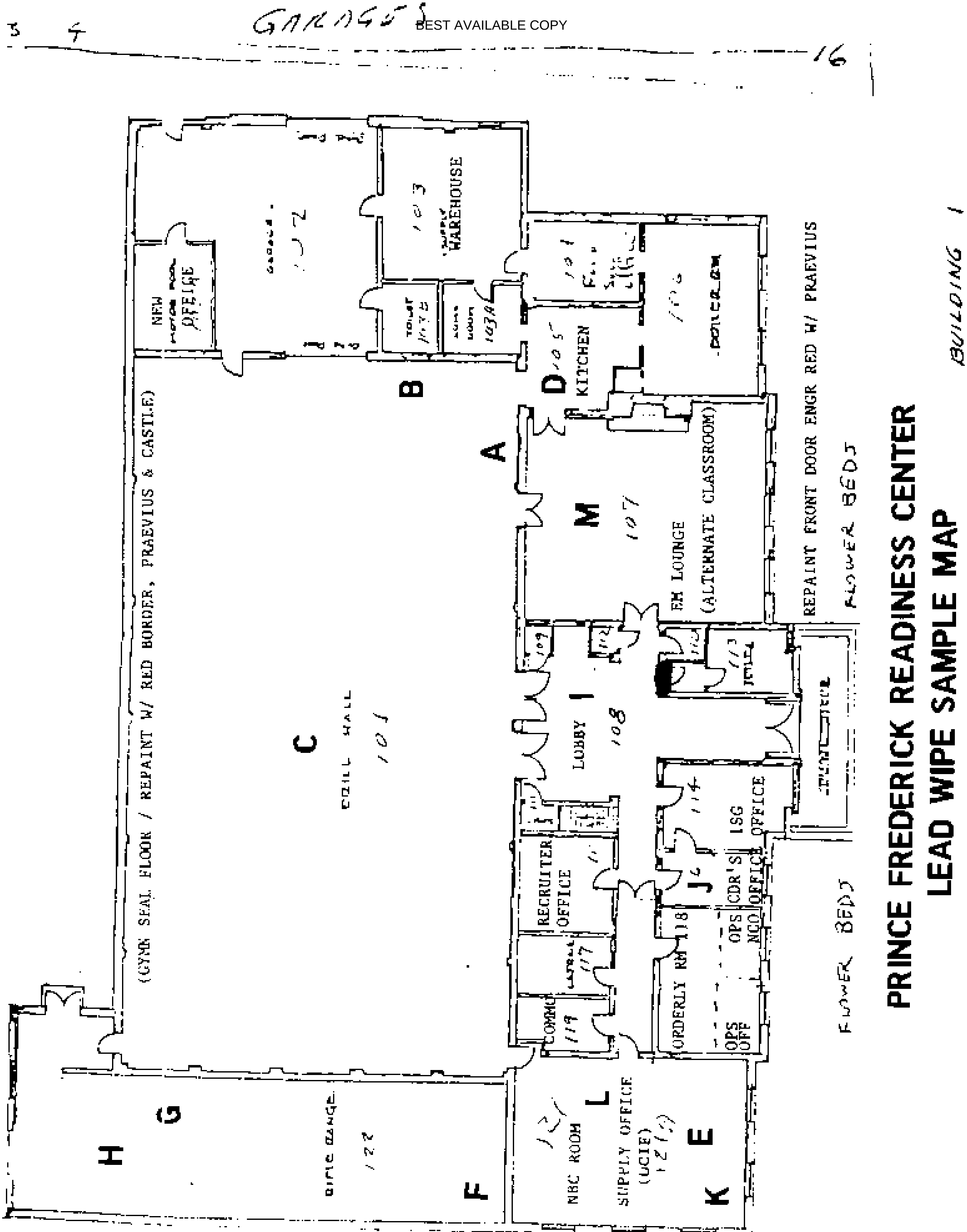
CLIENT ID NUMBER	SAMPLE INFORMATION: SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
071508-SW014		7/15/08		—				X									Date/Time: Contact: By:
071508-SW015		7/15/08		—				X									
071508-A001		↓	875.6					X		X							
071508-A002			884.4					X		X							
071508-A003		↓	—					X		X							Date/Time: Contact: By:
LBP-001		↓						X			X						
LBP-002								X			X						
LBP-003		↓						X			X						
ACM-001		↓					X				X						Date/Time: Contact: By:
ACM-002		↓					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: ____

BEST AVAILABLE COPY

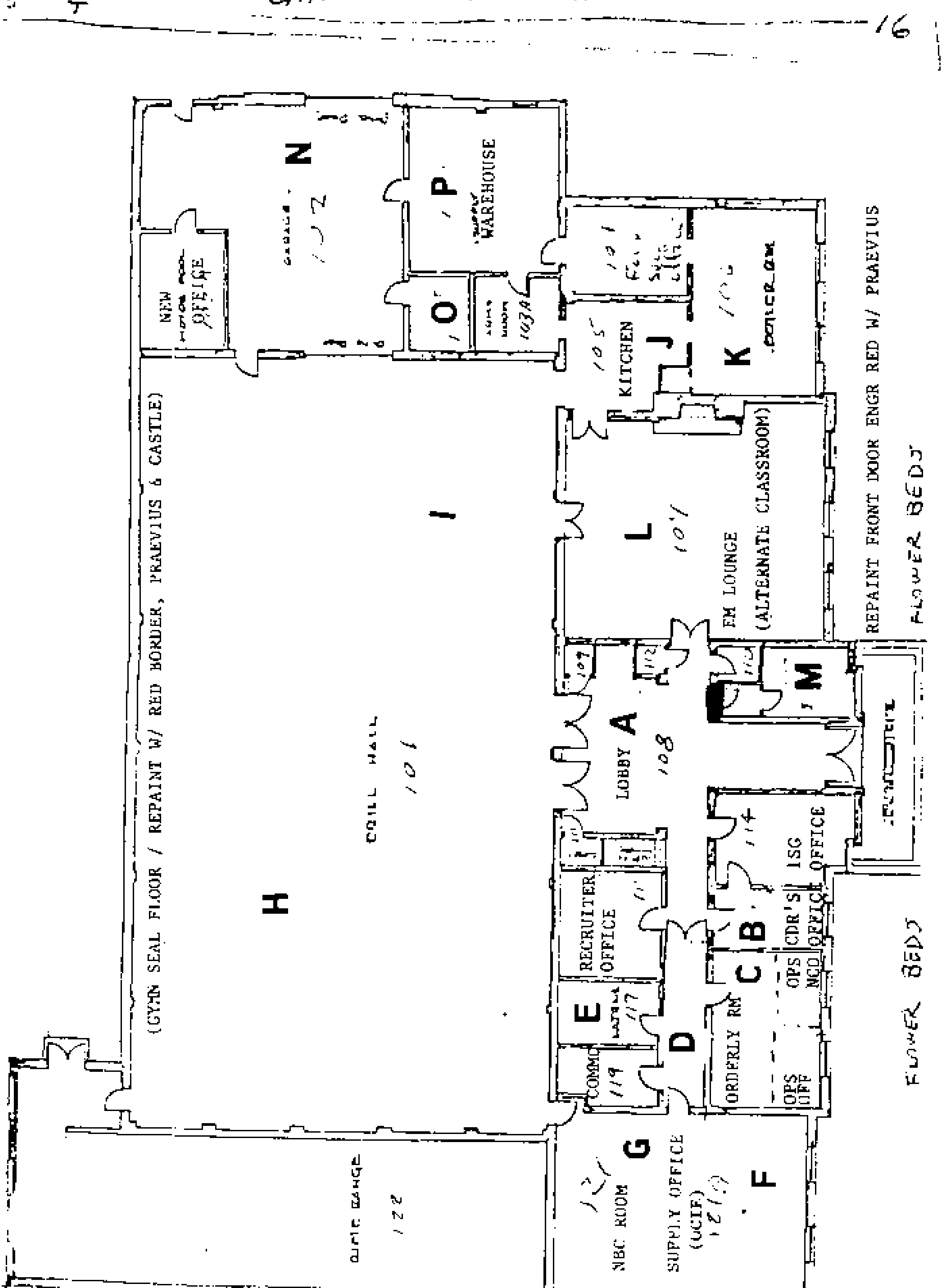
APPENDIX D

WIPE SAMPLING LOCATION MAP


GARAGES
16
PRINCE FREDERICK READINESS CENTER
LEAD WIPE SAMPLE MAP
BUILDING 1
REPAINT FRONT DOOR ENGR RED W/ PRAEVIUS
FLOWER BEDS
FLOWER BEDS
EM LOUNGE
(ALTERNATE CLASSROOM)
M
107
A
D
KITCHEN
105
WAREHOUSE
103
NEW MOTOR POOL OFFICE
B
C
DRILL HALL
101
(GYM SEAL FLOOR / REPAINT W/ RED BORDER, PRAEVIUS & CASTLE)
LOBBY
I
108
ISG OFFICE
114
CDR'S OFFICE
J
RECRUITER OFFICE
OPS NCO
ORDERLY RM 118
OPS OFF
COMMO
119
117
L
SUPPLY OFFICE
(UCIE)
NBC ROOM
E
K
F
G
H
RIFLE RANGE
122

APPENDIX E

ILLUMINANCE READING MAP



PRINCE FREDERICK READINESS CENTER ILLUMINATION SURVEY MAP

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:**	159372
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Prince Frederick, MD	**Date Analyzed:**	7/24/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EHS08794.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided		

Attention: [redacted]

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Color	Homogeneity	Analyst ID	Comments
0871091	ACM-001	NAD	--	--	--	--	1.5	--	TR	--	--	99	Off-White	Homogeneous	VS	
0871092	ACM-002	NAD	--	--	--	--	--	--	10	--	--	90	Beige	Heterogenous	VS	

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

V. Soto

Vicki Soto

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

MCHB-TS-OFS

MAY 11 2007

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

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

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

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

FOR THE COMMANDER:

[redacted]

Encl

CIH
Director, Occupational Health Sciences

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

Readiness thru Health

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

USACHPPM

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

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

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

Readiness Thru Health

DESTRUCTION NOTICE - Destroy by any method that will prevent disclosure of contents or reconstruction of the document.

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

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

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

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

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

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

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

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

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

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

BEST AVAILABLE COPY

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

MCHB-TS-OFS

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

1. PURPOSE. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) COL Victor P. Gillespe Armory, Queen Anne, MD, to identify and measure the existence and extent of potentially hazardous operations or conditions. The survey will serve to establish a baseline so that a worker's history of exposures is provided for each civilian or military employee.

2. CONCLUSIONS. Significant health and safety concerns were extremely high levels of lead in surface dust in the former indoor firing range (IFR); small areas of deteriorating paint-containing lead, which could generate lead dust hazards if not remedied; the lack of any record of an asbestos survey; and the lack of written occupational safety and health programs.

3. RECOMMENDATIONS.

a. Lead Exposure. Health Risk Assessment Code (RAC) 2.

(1) Establish and execute a lead hazard management plan for all lead in the facility, and take immediate corrective action where a possible lead-related health hazard has been identified.

(2) Repair and stabilize all deteriorated paint in the Armory.

(3) Clean all areas in and adjacent to the former IFR immediately, and clean other areas where sampling results showed elevated levels of lead. Follow the guidelines for cleaning in Appendix E of the report. Ensure that cleaning is performed in compliance with the Occupational Safety and Health Administration Lead in Construction Standard, Title 29 Code of Federal Regulations Part 1926.62, and National Guard Pamphlet 420-15.

Readiness thru Health

(4) If cleaning cannot be accomplished immediately, restrict access to the former IFR by keeping it locked. Post a sign warning against entry except in an emergency and against storing any material there. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. Address all potential lead hazards before extending this facility for use by children. If children will use this facility in the future, clean surfaces to the Environmental Protection Agency and State of Maryland lead in dust standard for children under 6 years of age of 40 micrograms per cubic meter of foot ($\mu g/ft^2$) on floors. Clean all remaining areas to the National Guard Bureau Region North Industrial Hygiene Office and United States Army Center for Health Promotion and Preventive Medicine recommended level of 200 $\mu g/ft^2$ for lead in dust on all other surfaces.

b. Asbestos Exposure. No RAC can be assigned at this time. Perform an asbestos survey and take action on the results as required.

c. Occupational Safety and Health Programs. Health RAC 4. Ensure that written programs are developed, implemented, and maintained.

d. Safety. Safety RAC 4. Eliminate trip hazards such as extension cords.

BEST AVAILABLE COPY

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

CONTENTS

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

1. REFERENCES. See Appendix A.

2. PURPOSE. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) COL Victor P. Gillespe Armory, Queen Anne, MD, to identify and measure the existence and extent of potentially hazardous operations or conditions. The survey will serve to establish a baseline so that a worker's history of exposures is provided for each civilian or military employee.

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

4. GENERAL.

a. Personnel Contacted. SSG [redacted], Environmental Compliance Assessment Coordinator, MDARNG; SFC [redacted], Facility Manager; SFC [redacted] Readiness NCO; and Mr. [redacted], Caretaker.

b. Survey Personnel. Ms. [redacted], Industrial Hygienist, United States Army Center for Health Promotion and Preventive Medicine (USACHPPM), conducted this survey on 26 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 was built in 1976. No floor plan could be located for this report. The Armory mission was recruitment and retention. The resident units included

Use of trademarked name(s) does not imply endorsement by the US Army but is intended only to assist in the identification of a specific product.

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

5. METHODOLOGY.

a. 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 NGB criterion for lead in surface dust is discussed in Appendix B. The American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) publishes criteria for indoor air quality. The National Fire Protection Association provides standards for fire and life safety. The Illumination Engineering Society – North America provides standards for minimum light levels.

b. 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, the air, and deteriorated paint for lead; observation of work practices and procedures; and employee interviews.

6. FINDINGS AND DISCUSSION.

a. Description of Operations. There were no industrial operations. The Armory consisted of a drill hall, classroom, offices, and storage areas. There was a former indoor firing range (IFR) that was being used as a weight and exercise room and as a storage room for a tractor. The walls had been repainted and the ventilation system had been removed.

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

c. Building Condition. The building was in good condition, except for areas of deteriorating paint.

d. Indoor Environmental Quality.

BEST AVAILABLE COPY

(1) Heating, Ventilation, and Air-Conditioning Systems. The offices, kitchen, and classroom were served by a central heating and air conditioning system. Ventilation for the rest of the building was provided by operable windows.

(2) Temperature and Humidity Control. The indoor temperatures of 78.9 degrees Fahrenheit (º F) in Room 117 (Caretaker's Office/SGT [redacted] and 75º F in Room 105 (Manager's Office/SGT [redacted] were within the ASHRAE recommended guidelines for an acceptable thermal environment of 73-79º F in the summer. The outdoor air temperature was 84º F. The relative humidity (RH) levels of 46.2 percent measured in room 117 and 46.1 percent in room 105 met the ASHRAE recommended guidelines of 30-60 percent RH. The outdoor RH was 72 percent.

(3) Air Exchange Rate. The outdoor carbon dioxide measurement was 350 parts per million (ppm), slightly below the actual background of 380 ppm or more. To ensure occupant comfort, ASHRAE recommends that the carbon dioxide concentration in the room not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration. Therefore, the total carbon dioxide level should not exceed approximately 1,080 ppm. The indoor carbon dioxide levels of 500 ppm in room 117 and 482 ppm in room 105 were within the ASHRAE recommended guidelines in spite of the instrument readings being low.

(4) Mold. No mold was observed. The observed high levels of RH were a potential source of moisture for mold growth. In case of future need, mold cleanup guidance is provided in Appendix F.

e. Water Quality. The Armory was connected to a municipal water supply. No complaints or concerns were reported.

f. Lead Hazards. Photographs of sampling locations are provided in Appendix C. Laboratory reports are in Appendix D.

(1) Lead in air. Results were below the laboratory analytical detection limit as well as the OSHA 8-hour time-weighted average PEL of 50 milligrams per cubic meter ($\mu g/m^3$).

(2) Lead in surface dust.

(a) Criteria. The Environmental Protection Agency (EPA) and State of Maryland limits for lead in dust are 40 micrograms per square foot ($\mu g/ft^2$) on floors, 250 $\mu g/ft^2$ on windowsills, and 400 $\mu g/ft^2$ in window troughs. These limits apply to pre-1978 Army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The NGB Region North Industrial Hygiene Office concurs with the USACHPPM recommended maximum level of

200 µg/ft^2 on floors and frequently contacted surfaces, which is more stringent for windowsills than the EPA/State standards. This level was developed for adult employees in the workplace and was adopted from OSHA Compliance Letter 02-02-58. Further information is provided in Appendix B.

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

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

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

(c) Lead in Paint. The date of construction of the facility indicates that the use of lead-based paint was possible. Areas of deteriorated paint on the corridor wall leading to the former IFR and on the ceiling in the kitchen around the access panel were sampled. The results were 0.0097 percent and 0.0092 percent respectively, well below the EPA and State of Maryland definition for lead-based paint of 0.5 percent. However, deteriorating paint containing detectable lead may create dust lead hazards.

g. Asbestos. Asbestos was not known to be present in the facility, and no potential asbestos-containing materials were observed. No records of an asbestos survey were found.

BEST AVAILABLE COPY

h. Noise Dosimetry. No operations with the potential to generate hazardous noise levels were identified.

i. Illumination. All areas appeared to be adequately lit and occupants reported no areas of deficient lighting.

j. Safety. As shown in Photograph 6, Appendix C, an extension cord across a corridor posed a trip hazard.

7. CONCLUSIONS. Significant health and safety concerns were: extremely high levels of lead in surface dust in the former IFR; small areas of deteriorating paint containing lead, which could generate dust lead hazards if not remedied; the lack of any record of an asbestos survey; and the lack of written occupational safety and health programs.

8. RECOMMENDATIONS.

a. Lead Exposure. Health RAC 2.

(1) Establish and execute a lead hazard management plan for all lead in the facility, and take immediate corrective action where a possible lead-related health hazard has been identified.

(2) Repair and stabilize all deteriorated paint in the Armory.

(3) Clean all areas in and adjacent to the former IFR immediately, and clean other areas where sampling results showed elevated levels of lead. Follow the guidelines for cleaning in Appendix E. Ensure that cleaning is performed in compliance with the OSHA Lead in Construction Standard, 29 Code of Federal Regulations Part 1926.62 and National Guard Pamphlet 420-15.

(4) If cleaning cannot be accomplished immediately, restrict access to the former IFR by keeping it locked. Post a sign warning against entry except in an emergency and against storing any material there. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. Address all potential lead hazards before extending this facility for use by children. If children will use this facility in the future, clean surfaces to the EPA and State of Maryland lead in dust standard for children under 6 years of age of 40 $\mu g/ft^2$ on floors and clean all remaining areas to the NGB Region North Industrial Hygiene Office and USACHPPM decontamination level of 200 $\mu g/ft^2$ for lead in dust on all other surfaces.

b. Asbestos Exposure. No RAC can be assigned at this time. Perform an asbestos survey and take action on the results as required.

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

c. Occupational Safety and Health Programs. Health RAC 4. Ensure that written programs are developed, implemented, and maintained.

d. Safety. Safety RAC 4. Eliminate trip hazards such as extension cords.

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

[redacted]
Industrial Hygienist
Industrial Hygiene Field Services Program

APPROVED:

[redacted]
MAJ, MS
Program Manager
Industrial Hygiene Field Services Program

APPENDIX A

REFERENCES

1. Occupational Safety and Health Administration, Title 29, Code of Federal Regulations (CFR), Parts 1910 and 1926, current ed. http://www.osha.gov/comp-links.html

2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 62.1-2004, Ventilation for Acceptable Indoor Air Quality. http://www.ashrae.org

3. EPA 40 CFR Part 745, Lead; Identification of Dangerous Levels of Lead; Final Rule, 5 Jan 01.

4. Department of Defense Instruction (DODI) 6055.1, Department of Defense Safety and Occupational Health (SOH) Program, 19 Aug 98. http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf

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

BEST AVAILABLE COPY

APPENDIX B

Assessment Criteria For Lead

Subject: Recommendations for Surface Lead Dust in Armories

1. In armories that do not contain childcare facilities, the National Guard Bureau (NGB) Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 micrograms per square foot (μg/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 μg/ft^2) and windowsills (250 μg/ft^2) in residential dwellings and child occupied facilities. A child occupied facility is defined as a building, or portion of a building, constructed prior to 1978, visited regularly by the same child, 6 years of age or under, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hours and the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60 hours. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

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

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

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 μg/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.

BEST AVAILABLE COPY

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

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,

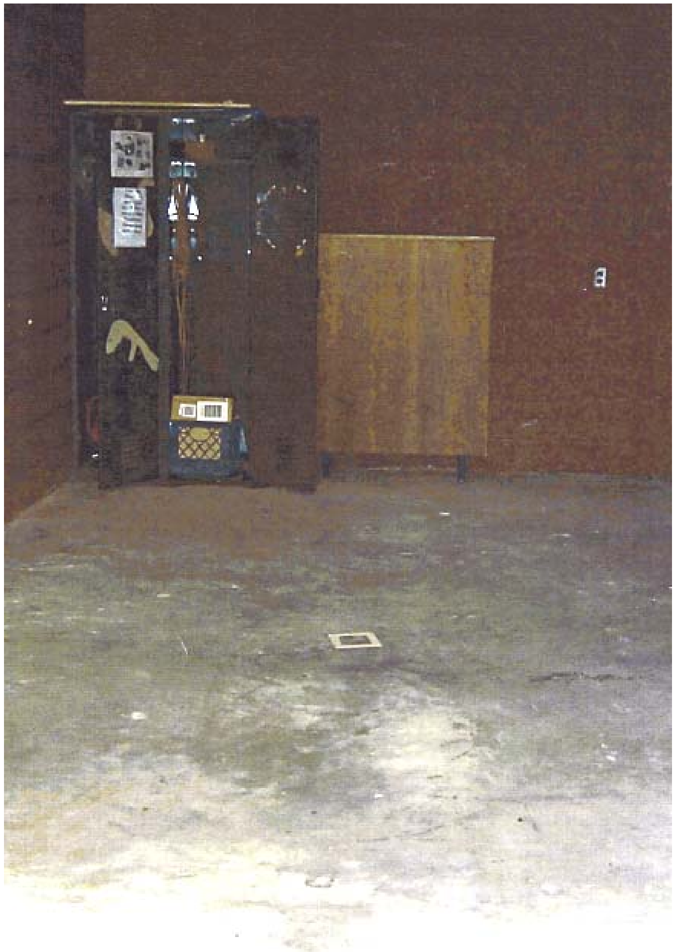
BEST AVAILABLE COPY

APPENDIX C

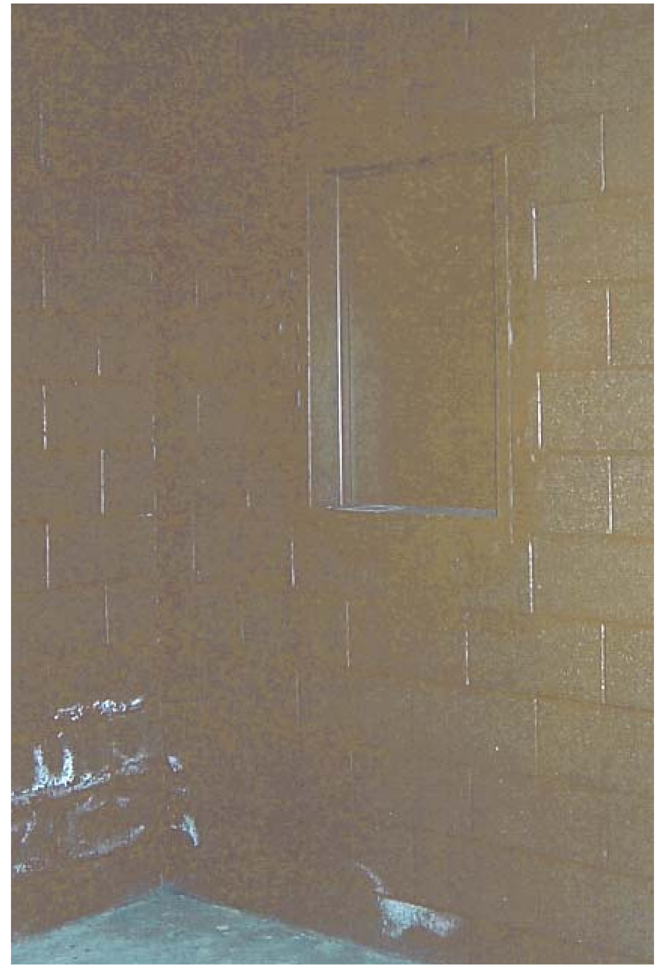
TABLE C-1. Photographs of Wipe Sampling Locations.

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

BEST AVAILABLE COPY



Photograph 1.



Photograph 2.

BEST AVAILABLE COPY

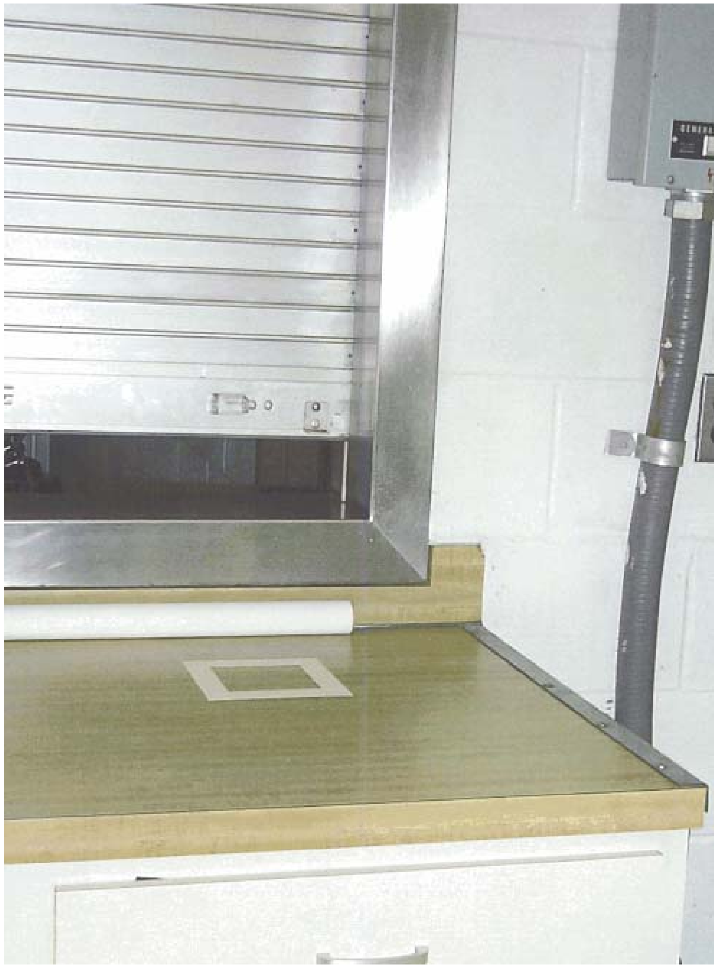
Photograph 3.

Photograph 4.

BEST AVAILABLE COPY

Photograph 5.

Photograph 6.



Photograph 7.

Photograph 8.

Photograph 9.

Photograph 10.

APPENDIX D

LABORATORY REPORTS

Queen Anne

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP
NY ELAP
AIHA

Client:	National Guard Bureau	**Job Name:**	Not Provided	**Chain Of Custody:**	116952
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Analyzed:**	09/09/2003
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	09-Sep-03
Attention:	[redacted]				

Page 1 of 2

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Final Result	Comments
0366784	QA Blank 01	Flame	Wipe Blank	****	N/A	12.00 ug	< 12 ug	
0366785	QA Wipe 01	Flame	Wipe	****	0.108	111.52 ug/ft^2	3700 ug/ft^2	
0366786	QA W02	Flame	Wipe	****	0.108	111.52 ug/ft^2	2100 ug/ft^2	
0366787	QA W03	Flame	Wipe	****	0.108	111.52 ug/ft^2	63000 ug/ft^2	
0366788	QA W04	Flame	Wipe	****	0.108	111.52 ug/ft^2	530 ug/ft^2	
0366789	QA W05	Flame	Wipe	****	0.108	111.52 ug/ft^2	< 110 ug/ft^2	
0366790	QA Blank 02	Flame	Wipe Blank	****	N/A	12.00 ug	< 12 ug	
0366791	QA W06	Flame	Wipe	****	0.108	111.52 ug/ft^2	610 ug/ft^2	
0366792	QA W07	Flame	Wipe	****	0.108	111.52 ug/ft^2	< 110 ug/ft^2	
0366793	QA W08	Flame	Wipe	****	0.108	111.52 ug/ft^2	< 110 ug/ft^2	
0366794	QA W09	Flame	Wipe	****	0.108	111.52 ug/ft^2	< 110 ug/ft^2	
0366795	QA Bulk 01	Flame	Paint Chip	****	N/A	0.01 %Pb	< 0.0097 %Pb	
0366796	QA Bulk 02	Flame	Paint Chip	****	N/A	0.01 %Pb	< 0.0092 %Pb	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP
NY ELAP
AIHA

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

Job Name: Not Provided
Job Location: Not Provided
Job Number: Not Provided
P.O. Number: Not Provided

Chain Of Custody: 116952
Date Analyzed: 09/09/2003
Person Submitting: [redacted]
Report Date: 09-Sep-03

Page 2 of 2

Summary of Atomic Absorption Analysis for Lead

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

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

Analyst: J Willoughby
Jodi Willoughby

Technical Manager: G Edward Carney

An AIHA (#8863), NVLAP (# 101143), & New York ELAP (#10920) Accredited Laboratory
4475 Forbes Blvd. • Lanham, MD 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (301) 459-2643

BEST AVAILABLE COPY

APPENDIX E

LEAD CLEANING GUIDANCE

CHAPTER 14: CLEANING

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.

BEST AVAILABLE COPY

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).

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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).

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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).

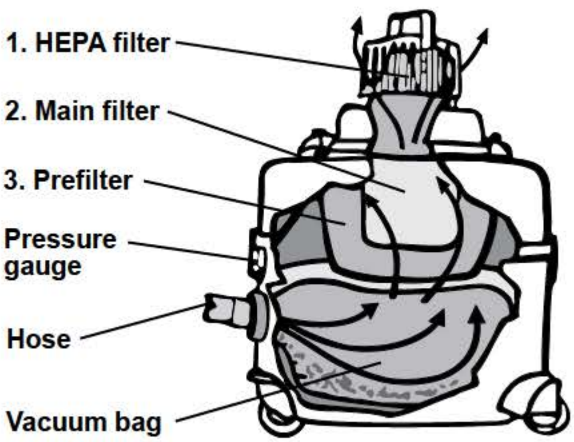
All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards *and* were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways,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

BEST AVAILABLE COPY

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.

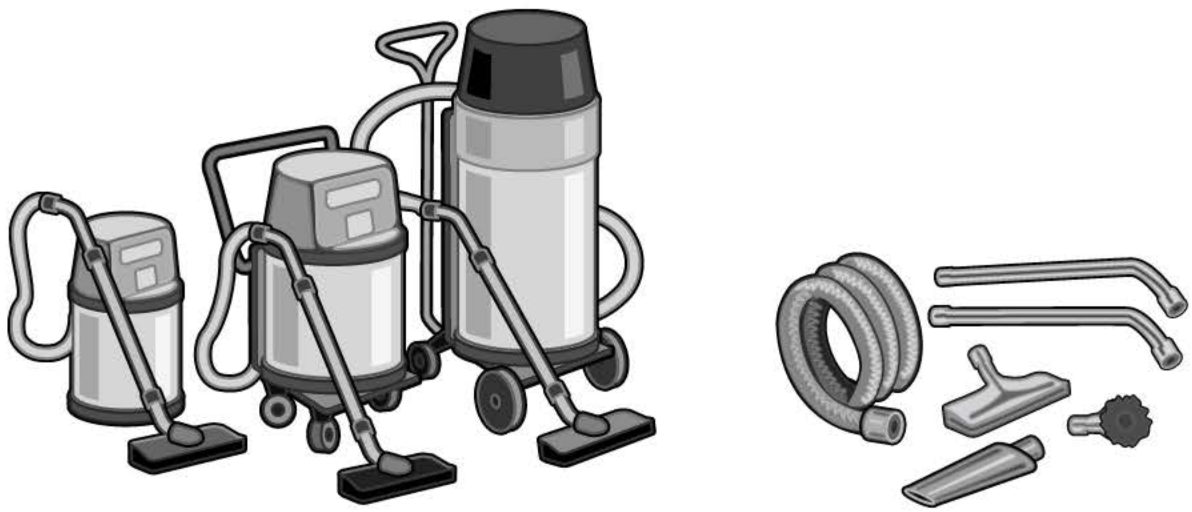
2. Wet Detergent Wash

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.

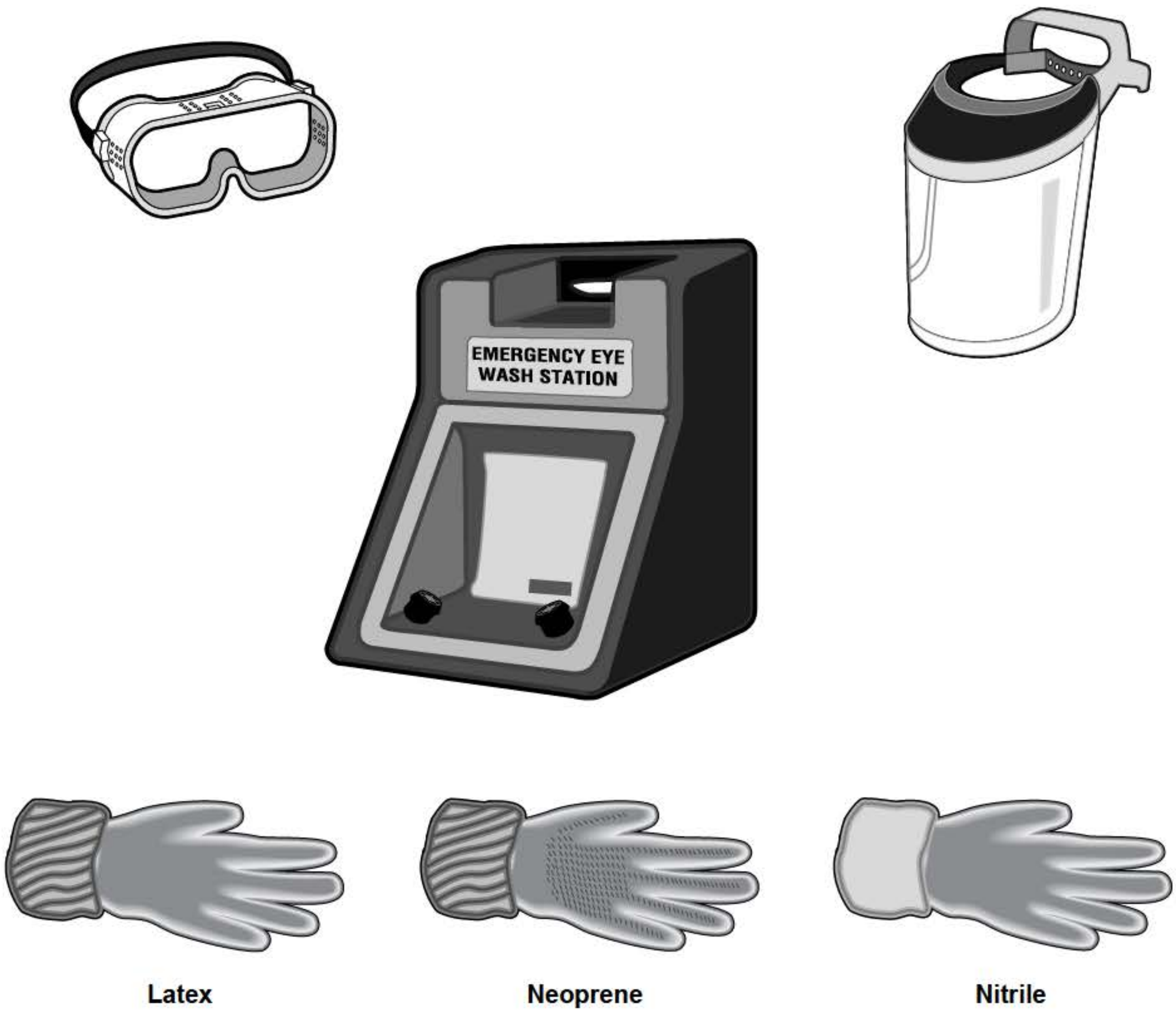
Proper Wet-Cleaning Procedures

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

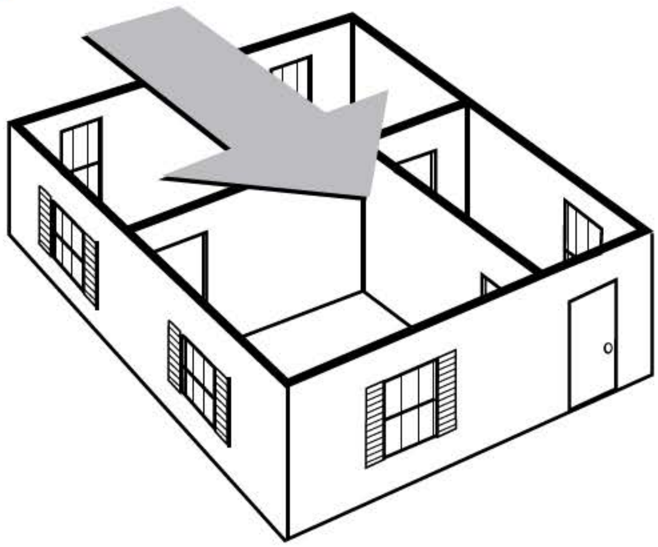
Typical Procedures

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:

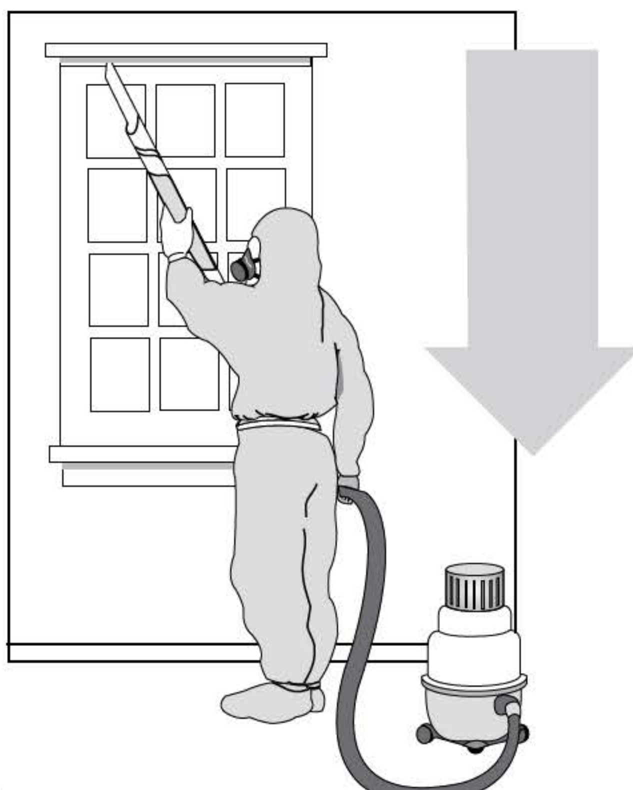
- First, the area is HEPA vacuumed.

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

BEST AVAILABLE COPY

- 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

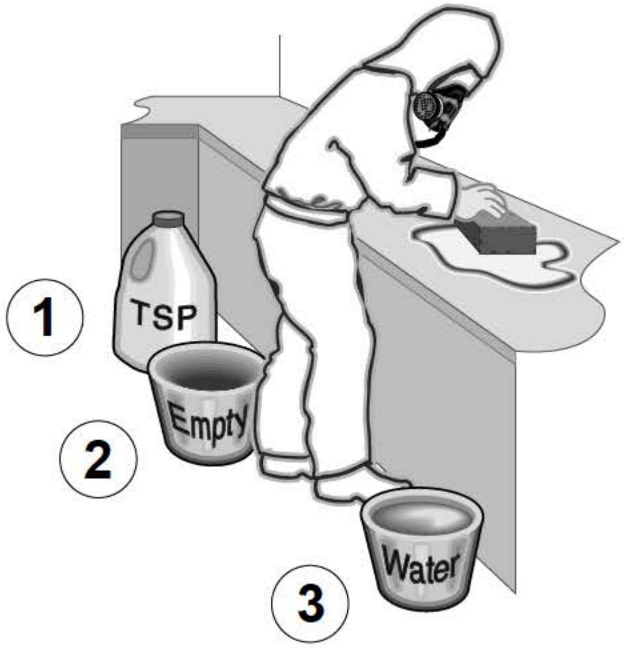
Dust Brush

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

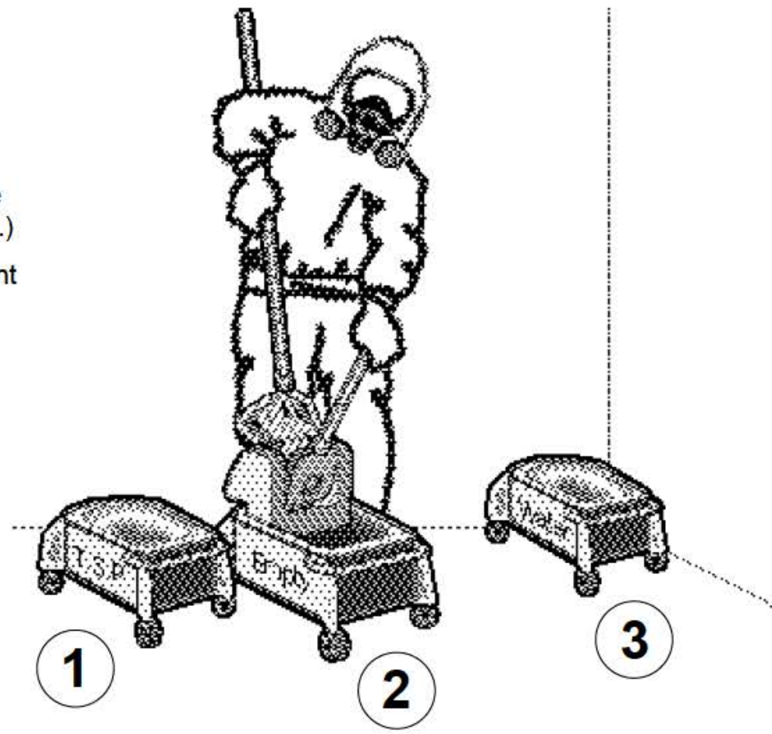
Don't Dry Sweep

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.

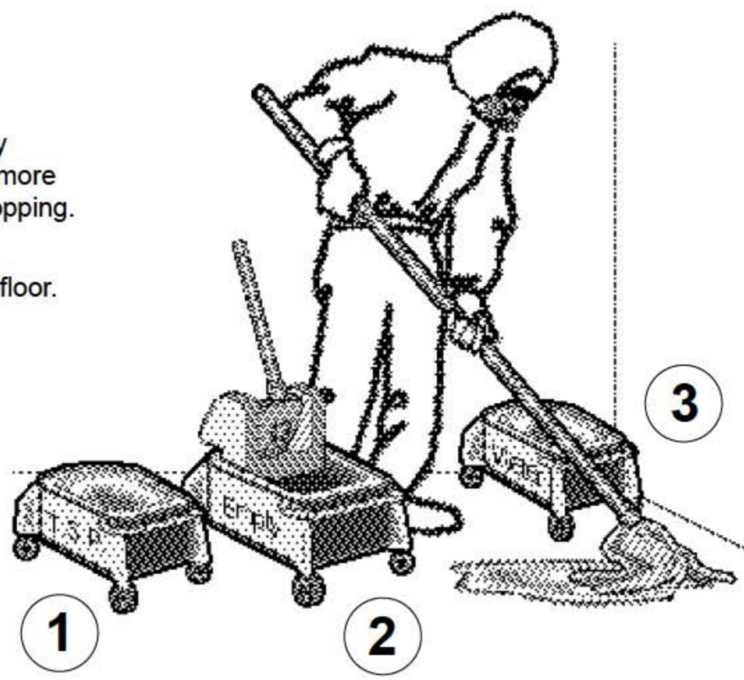
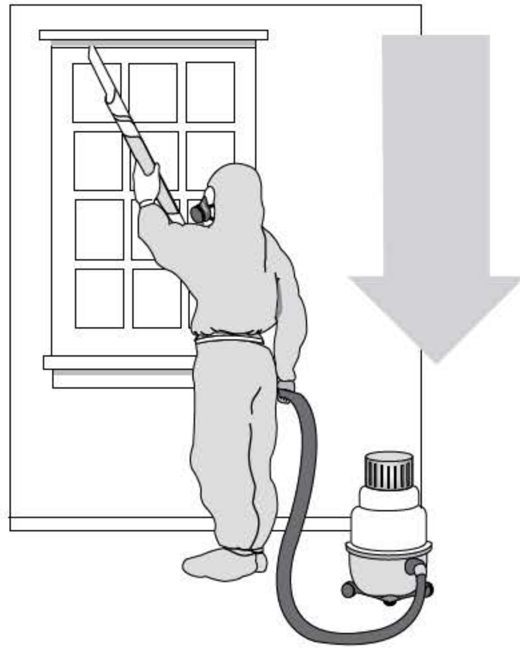


Figure 14.4d (continued)

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.

1. Large Debris

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

2. Small Debris

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

3. Exterior Cleaning

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

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

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

4. Worker Protection Measures

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

5. Maintaining Containment

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

V. Order of Final Cleaning Procedures After Lead Hazard Control

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

A. Final Cleaning

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

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

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

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

1. Decontamination of Workers, Supplies, and Equipment

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

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

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

BEST AVAILABLE COPY

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*

BEST AVAILABLE COPY

APPENDIX F

MOLD CLEANING GUIDANCE

BEST AVAILABLE COPY

Army Facilities Management Information Document on Mold Remediation Issues

TG 277

FEBRUARY 2002

USACHPPM

Readiness thru Health

CONSERVARE SALUTEM

BEST AVAILABLE COPY

ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

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.

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)

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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

BEST AVAILABLE COPY

£ 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.

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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).

BEST AVAILABLE COPY

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.

Local Reproduction is Authorized and Encouraged.

USACHPPM
Readiness thru Health

Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278
February 2002

USACHPPM
Readiness thru Health
CONSERVARE SALUTEM

BEST AVAILABLE COPY

Table of Contents

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.

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.

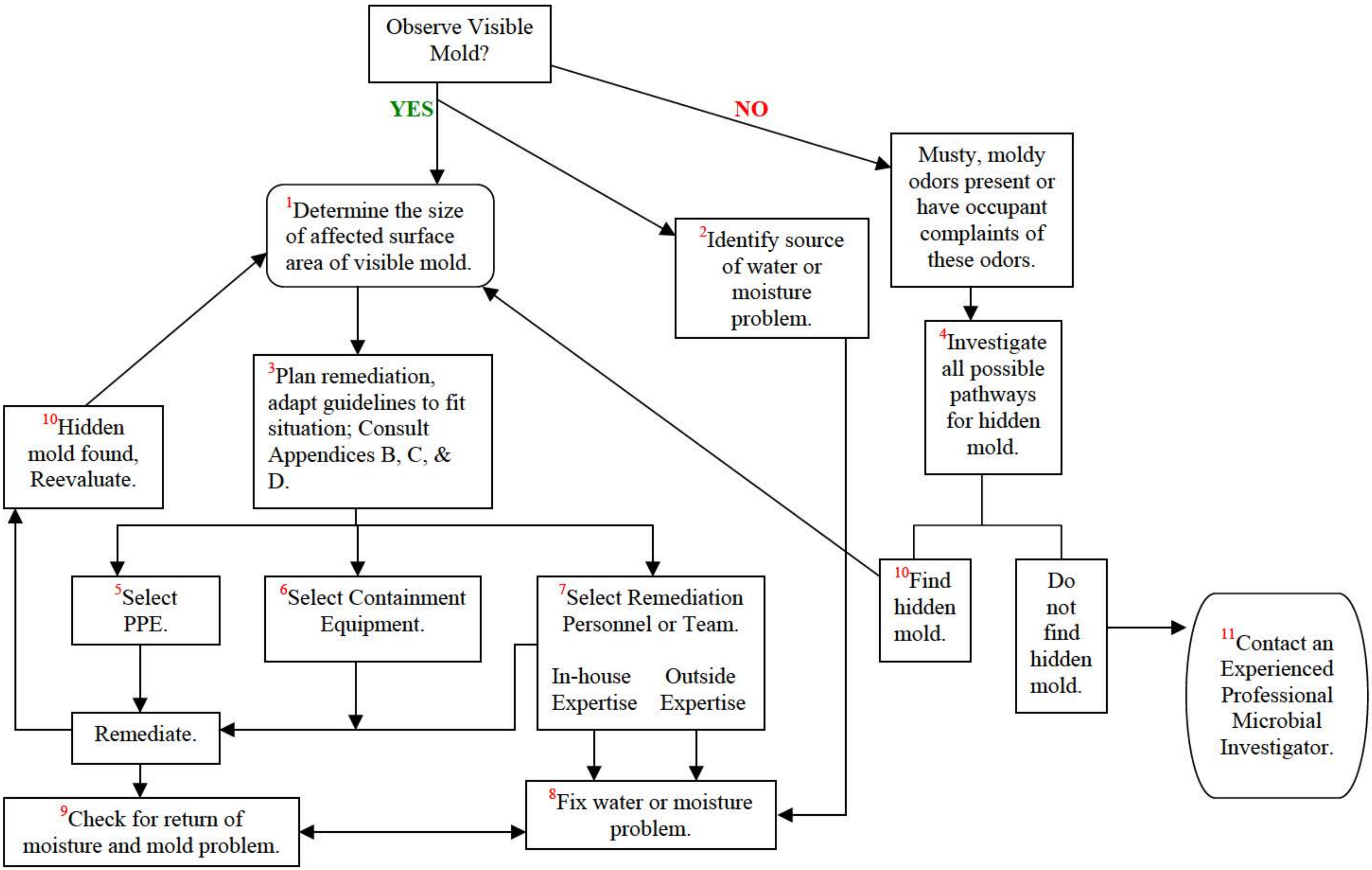
7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

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.

Local Reproduction is Authorized and Encouraged.

USACHPPM
Readiness thru Health

ANALYTICAL LABORATORY SERVICES, INC.

Environmental ✦ Industrial Hygiene ✦ Field Services www.analyticallab.com

Industrial Hygiene Survey

National Guard Facility
Queen Anne Armory
3011 Star Road
Queen Anne, MD 21657

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Queen Anne Armory** **3011 Star Road** **Queen Anne, MD 21657**
Prepared By:	**Analytical Laboratory Services, Inc.** **3544 North Progress Avenue** **Suite 100** **Harrisburg, PA 17110**
Survey Date:	**September 16, 2010**
Report Date:	**October 26, 2010**
ALSI Project #:	**1009598**

Non-Responsive [redacted]

Director, Environmental Health & Safety

Table of Contents

Section 1.0
Executive Summary

BEST AVAILABLE COPY

Section 1.0 Executive Summary

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

1. Lead surface and air samples were collected. All sample results were less than recommended guidelines or regulatory standards. Deteriorated paint was observed in some locations throughout the facility. Peeling and damaged paint should be repaired and properly remediated.

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

3. Relative humidity exceeded the recommended ceiling of 60% in some locations. Some doors and windows were open at the time of this survey. Relative humidity should be maintained at 30-60%. Low relative humidity can lead to the drying of mucous tissues and an increased susceptibility to respiratory infection. High relative humidity can provide an environment suitable for microbial growth and proliferation.

4. Water damaged ceilings and active roof leaks are present in some areas. Water damage is present on some block walls. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

5. Supply and return vents were dirty with some areas of possible fungal growth. Do not permit dirt, debris, microbial growth, etc. to accumulate in any portion of the HVAC system including the supply and return vents. Supply and return vents should be properly cleaned.

Section 2.0
Operation Description & Observations

BEST AVAILABLE COPY

Section 2.0 Operation Description & Observations

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

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

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

There is an old firing range in the building. It was closed in the 1970's and has been fully abated. It is now a storage area. There is no child-care facility in the building.

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

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

BEST AVAILABLE COPY

Section 3.0
Noise Survey

BEST AVAILABLE COPY

Section 3.0 Noise Survey

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

BEST AVAILABLE COPY

Section 4.0
Lead Testing

BEST AVAILABLE COPY

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	Room 111	<4.2		
3	Blank	<3 (ug)		
4	Converted Firing Range – Floor		<110	
5	Converted Firing Range – Weight Seat		<110	
6	Converted Firing Range – Top of Bench		<110	
7	Floor Outside Converted Firing Range		<110	
8	Drill Hall – Floor (Center)		<110	
9	Drill Hall – Top of Vending Machine		<110	
10	Drill Hall – Tabletop		<110	
11	Room 118 – Men's Locker Room, Top of Locker		<110	
12	Kitchen Countertop by Microwave		<110	
13	Room 11 – Supply Vent		<110	
14	Room 113 – Top of Desk		<110	
15	Entry Lobby – Floor		<110	
16	Blank		<12 (ug)	
Criteria		**50**	**200**	**0.5**

Key: **Bolded** results exceed listed criteria - Source: Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

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

The National Guard Bureau currently utilizes 200 ug/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

BEST AVAILABLE COPY

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.

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

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

BEST AVAILABLE COPY

Section 5.0
Lighting

BEST AVAILABLE COPY

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 111	199.2	30-50	Yes
Room 113	200.6	30-50	No
Room 11	101.7	30-50	Yes
Kitchen	97.1	50	Yes
Locker Room 118	17.5	7	Yes
Room 117	81.3	30-50	Yes
Room 115 Converted Firing Range	28.3	30-50	No
Drill Hall	28.8	30-50	No

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

BEST AVAILABLE COPY

Section 6.0
Indoor Air Quality

BEST AVAILABLE COPY

Section 6.0 Indoor Air Quality

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

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

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 72.7 to 77.0 degrees F with relative humidity readings ranging from 50.6% to 72.1%. During the survey, carbon dioxide (CO_2) levels ranged from 373 ppm to 419 ppm within the facility compared to an outdoor CO_2 level of 372 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,072 ppm (372 ppm + 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	79.3	72.7	380	0.4
Room 111	72.7	50.6	419	0.2
Room 113	73.8	**66.2**	401	0.5
Room 11	73.0	56.4	410	0.3
Kitchen	73.4	**67.2**	416	0.1
Locker Room 118	77.0	**68.5**	409	0.1
Room 117	76.5	**68.5**	408	0.2
Room 115 Converted Firing Range	74.8	**71.2**	381	0.4
Drill Hall	74.3	**72.1**	373	0.1
Outdoors	77.7	71.6	363	0.0
Criteria	**73.0-79.0**	**30-60**	**<1,072**	**<9.0**

Key: **Bolded** results exceed listed criteria

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

There is a central HVAC system in the building. Air-conditioning was on in the offices and many windows and doors were open. Outdoor conditions were hot and humid. Indoor relative humidity should be maintained at 30-60%. Low relative humidity can lead to the drying of mucous tissues and an increased susceptibility to respiratory infection. High relative humidity can provide an environment suitable for microbial growth and proliferation.

Carbon dioxide levels did not exceed the recommended ceiling of 1,072 ppm. This suggests that outdoor air ventilation is adequate in this area. There is a mechanical ventilation system for some areas of this facility which provides outdoor air ventilation.

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

A visual inspection was conducted throughout visually accessible portions of the facility. The visual inspection was conducted to assess sources or pathways of factors potentially deleterious to IAQ. The visual inspection revealed the following items that may be potential sources of poor IAQ:

1. Water damaged ceilings and roof leaks are present in some areas. Active roof leaks were reported in the Drill Hall and Lobby. Efflorescence was observed on some block walls suggesting water infiltration is present. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

2. There is standing water present on the floor of the boiler room. Drains should be repaired to properly removed water.

3. Supply and return vents were dirty with some areas of possible fungal growth. Do not permit dirt, debris, microbial growth, etc. to accumulate in any portion of the HVAC system including the supply and return vents. Supply and return vents should be properly cleaned.

BEST AVAILABLE COPY

Section 7.0
Suspect Asbestos Containing Building Materials

Section 7.0 Suspect Asbestos Containing Building Materials

Suspect asbestos containing materials (ACM) could include sheetrock/joint compound, plaster wall and ceiling systems, floor tiles and associated mastic, and vinyl cove base. Thermal system insulation which is most likely a combination of paper wrapped fiberglass with PVC elbows and well as pre-formed TSI with mudded elbows is a suspect material. No samples were collected. Inaccessible areas were not inspected.

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

1. Window glazing on the exterior of the building is damaged and in poor condition in some locations. This is a possible ACM.

2. 12" x 12" floor tile were observed in some areas of the facility. They were in good condition.

Section 8.0
Maintenance Bay

BEST AVAILABLE COPY

Section 8.0 Maintenance Bay

There is no garage area at this facility.

Section 9.0
Limitations

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

Appendix A
Laboratory Analysis Report

BEST AVAILABLE COPY

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:**	Queen Anne	**Chain Of Custody:**	508810
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Queen Anne, 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
1080649	1009598-1	Flame	Air	692	N/A	4.3	ug/m³	<3	<4.3	ug/m³	
1080650	1009598-2	Flame	Air	718	N/A	4.2	ug/m³	<3	<4.2	ug/m³	
1080651	1009598-3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1080652	1009598-4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080653	1009598-5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080654	1009598-6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080655	1009598-7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080656	1009598-8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080657	1009598-9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080658	1009598-10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080659	1009598-11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080660	1009598-12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080661	1009598-13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080662	1009598-14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080663	1009598-15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080664	1009598-16	Flame	Wipe	****	N/A	12	ug	<12	<12	ug	

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

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

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

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:	Queen Anne	Chain Of Custody:	508810
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Queen Anne, 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
Attention:	[redacted]			Report Date:	9/27/2010

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

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 Butruk

Analyst: Lom Buiruk

Technical Manager: G Edward Carney

Page 1 of 2

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

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **508810**

p1/2

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: Queen Anne
2. Job Location: Queen Anne, MD
3. Job #: [redacted] 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)
☐ 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 Made to Accommodate)
☐ 2 Day Date Due: 9/27/10

REPORT TO:
☒ Include [redacted] with Report
☒ E-mail: [redacted] @analyticallab.com
@us.army.mil
~~@us.army.mil~~
☐ Fax:
☐ Verbal: [redacted] nJ@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 __(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 Chi[redacted]
☒ 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 Trap/Air Samples:
Collection Media:
☐ Spore-Trap ____(QTY) ☐ Surface Vacuum Dust ____(QTY)
☐ Surface Swab ____(QTY) ☐ Culturable ID Genus (Media ____) ____(QTY)
☐ Surface Tape ____(QTY) ☐ Culturable ID Species (Media ____) ____(QTY)
☐ Other (Specify ____) ____(QTY)

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
1009598-1	Drill Hall	9/16	1098.2					X		X							Date/Time: Contact: By:
1009598-2	Rm 111		1118.1					X		X							
1009598-3	Blank		0					X		X							
1009598-4	Converted Fire Range Floor			100cm²				X				X					
1009598-5	Converted Fire Range Wall							X				X					Date/Time: Contact: By:
1009598-6	Converted Fire Range Top of Beam							X				X					
1009598-7	FI Outside Converted Fire Range							X				X					
1009598-8	Drill Hall Fl Center							X				X					
1009598-9	Drill Hall Top of Vent Mech.							X				X					Date/Time: Contact: By:
1009598-10	Drill Hall Tabletop							X				X					
1009598-11	Rm 118 Mens Locker Floor							X				X					
1009598-12	Kitchen Countertop							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

OW (410) 247-9824 | 1999/02 | 210 REV. 6.06

508810
p 2/2

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 Inquiries)

Mailing/Billing Information:

1. Client Name: National Guard Bureau
2. Address 1: 301-EH 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: Queen Anne
2. Job Location: Queen Anne, MD
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Per[redacted] @ phone # (410) 942-0273
5. Submitted b[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 Accommodate)	☒ Include COC/Field Data Sheets with Report
☐ 24 Hours Time Due: ___	☐ Next Day	☒ 5 Day +		☒ [redacted] @us.army.mil
Comments: ___	☐ 2 Day	Date Due: ___		☐ Fax: [redacted] @us.army.mil
				☐ Verba[redacted]

Asbestos Analysis

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

TEM Bulk
☐ ELAP 198.4/Chatfield ___ (QTY)
☐ NY State PLM/TEM ___ (QTY)
☐ Residual Ash ___ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ___ (QTY)
☐ Quant. (s/area) Vacuum D5755-95 ___ (QTY)
☐ 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 (1) Genus (Media ___) ___ (QTY)
☐ Surface Tape ___ (QTY) ☐ Culturable (1) Species (Media ___) ___ (QTY)
☐ Other (Specify ___) ___ (QTY)

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER/OTHER	WIPE	TAPE	SWAB	CLIENT CONTACT
1009598-13	Rm11 Supply Vent	9/12		100cm²				X				X					Date/Time: Contact: By:
1009598-14	Rm113 Top of Desk	↓		↓				X				X					
1009598-15	Entry Lobby Fl							X				X					
1009598-16	~~Bed~~ Blank	↓		0cm²				X				X					
																	Date/Time: Contact: By:
																	Date/Time: Contact: By:

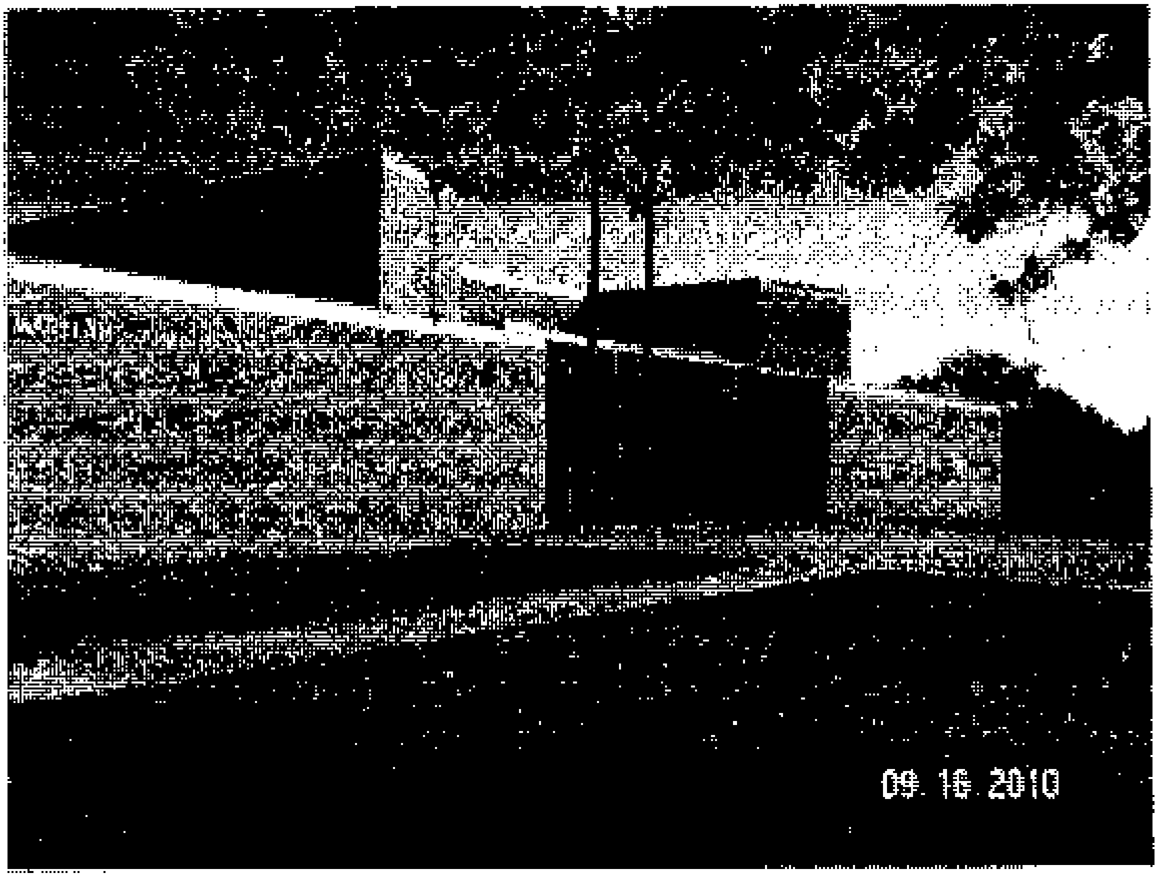
LABORATORY STAFF ONLY: (CUSTODY)

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

BEST AVAILABLE COPY

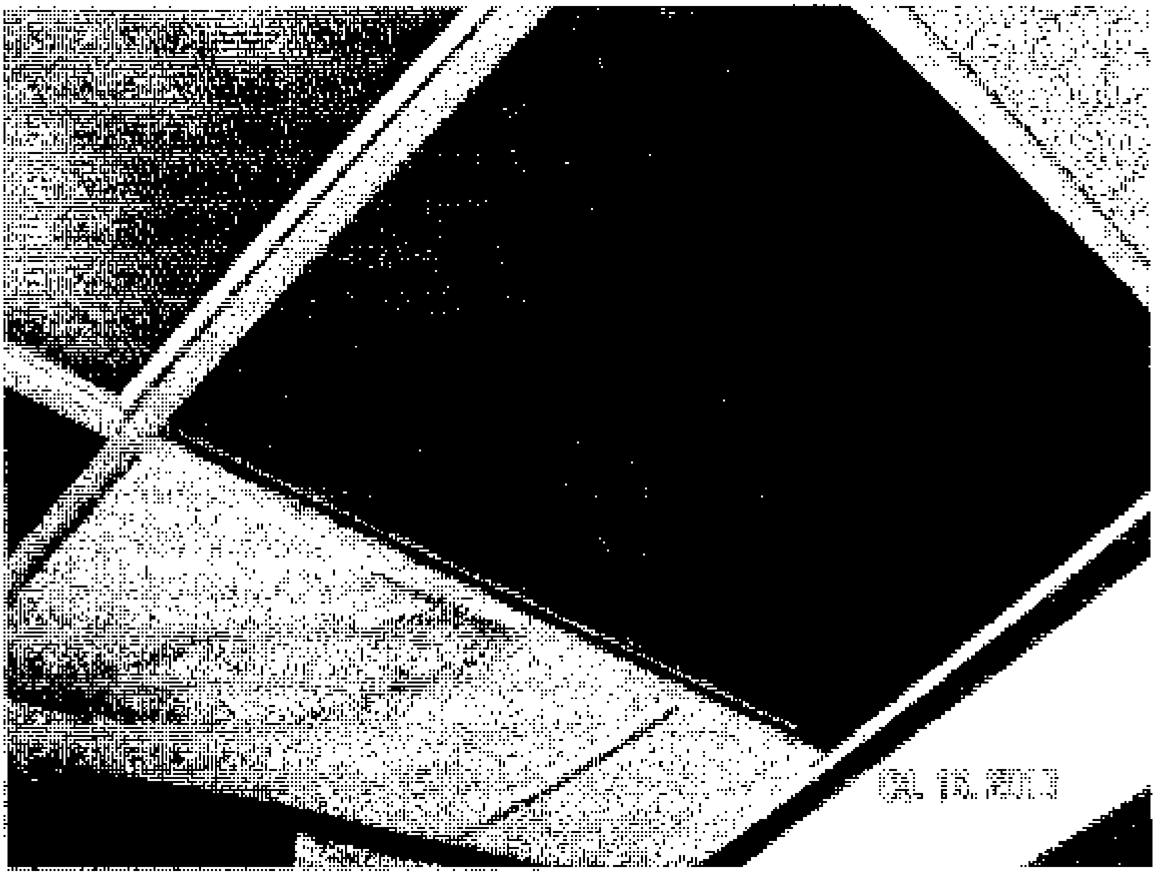
Appendix B
Photographs

BEST AVAILABLE COPY



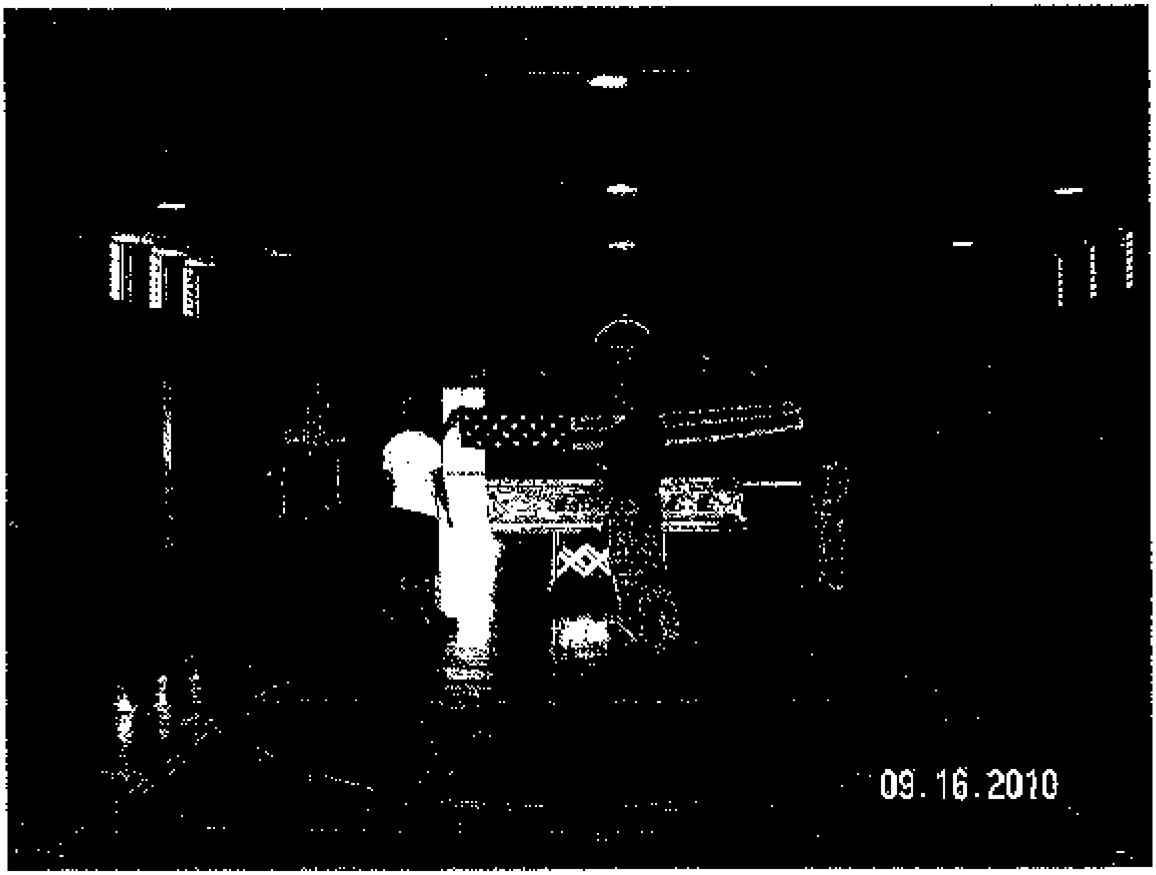
Queen Anne MD
Exterior

BEST AVAILABLE COPY

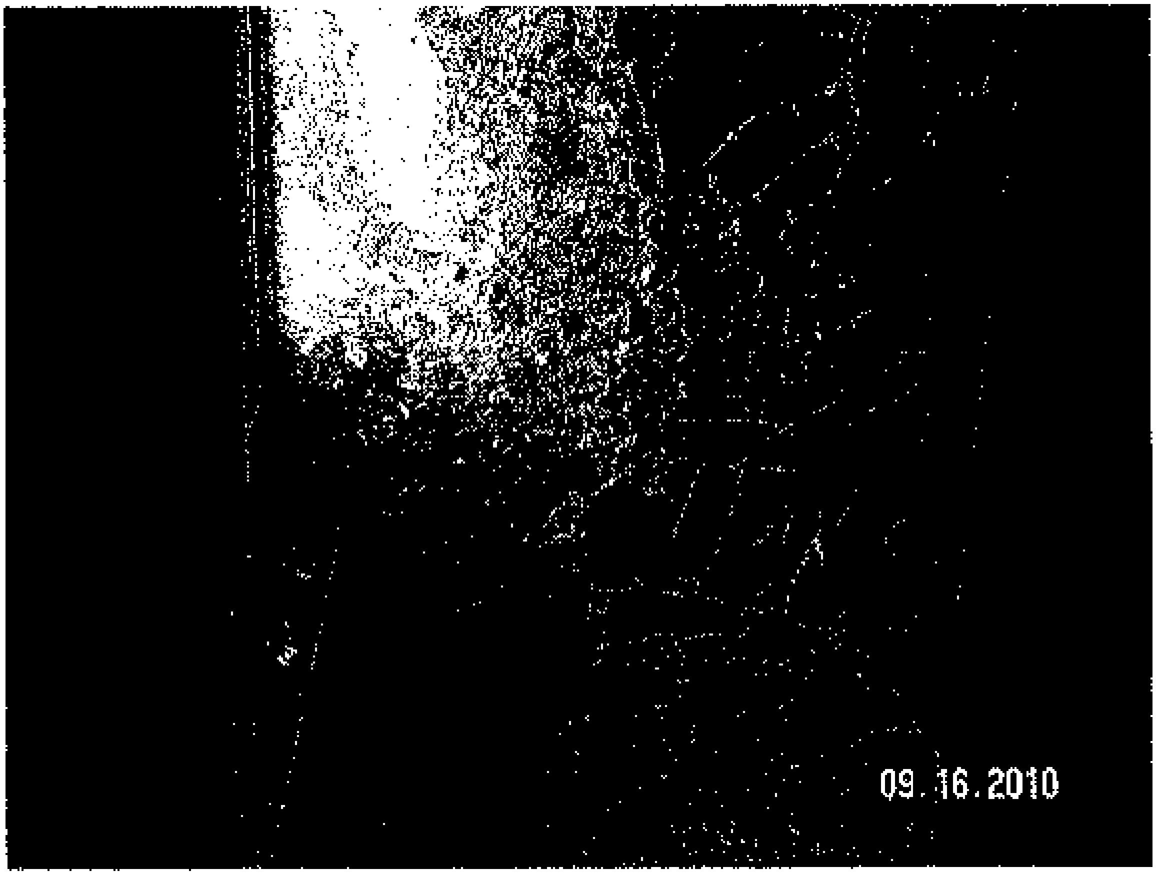


Queen Anne MD
Entry Lobby Ceiling – Water Damage, Chipping /Peeling Paint and Missing Ceiling Tiles from Roof Leak

BEST AVAILABLE COPY

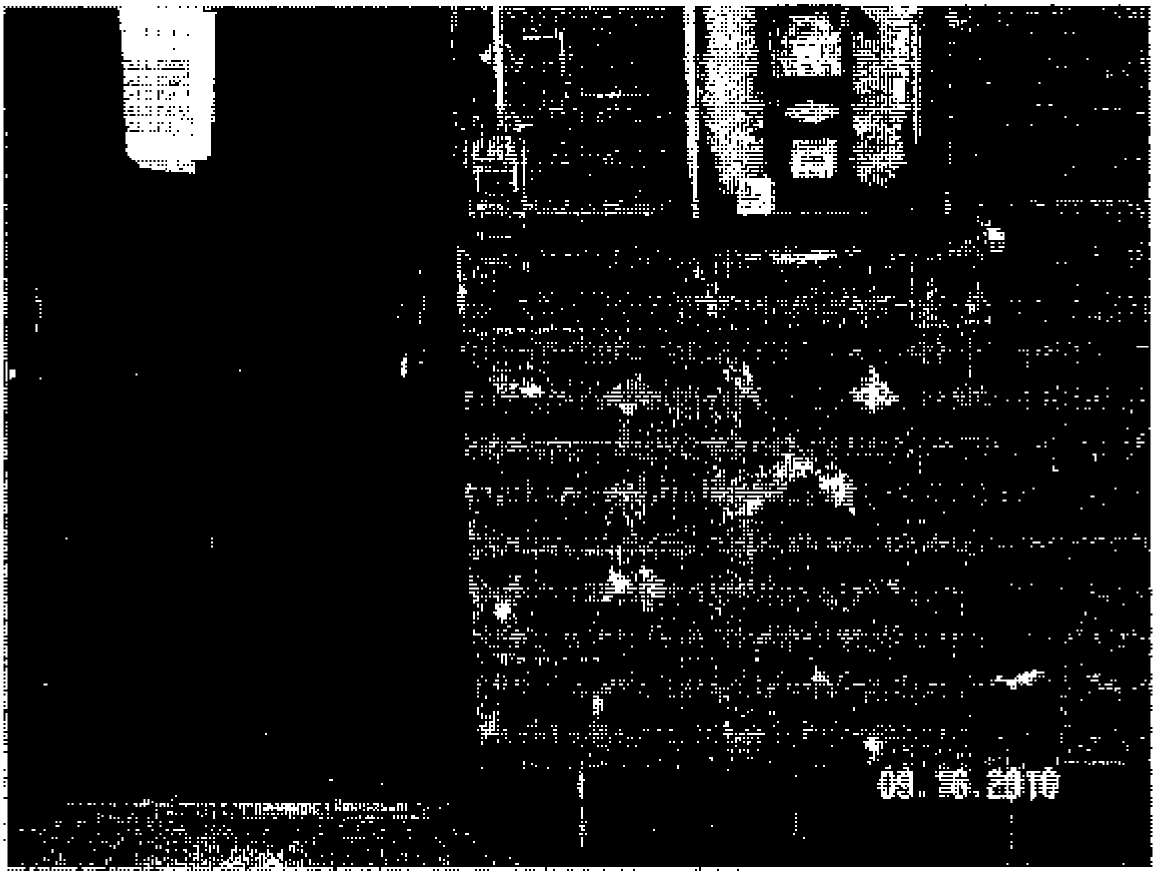


Queen Anne MD
Drill Hall

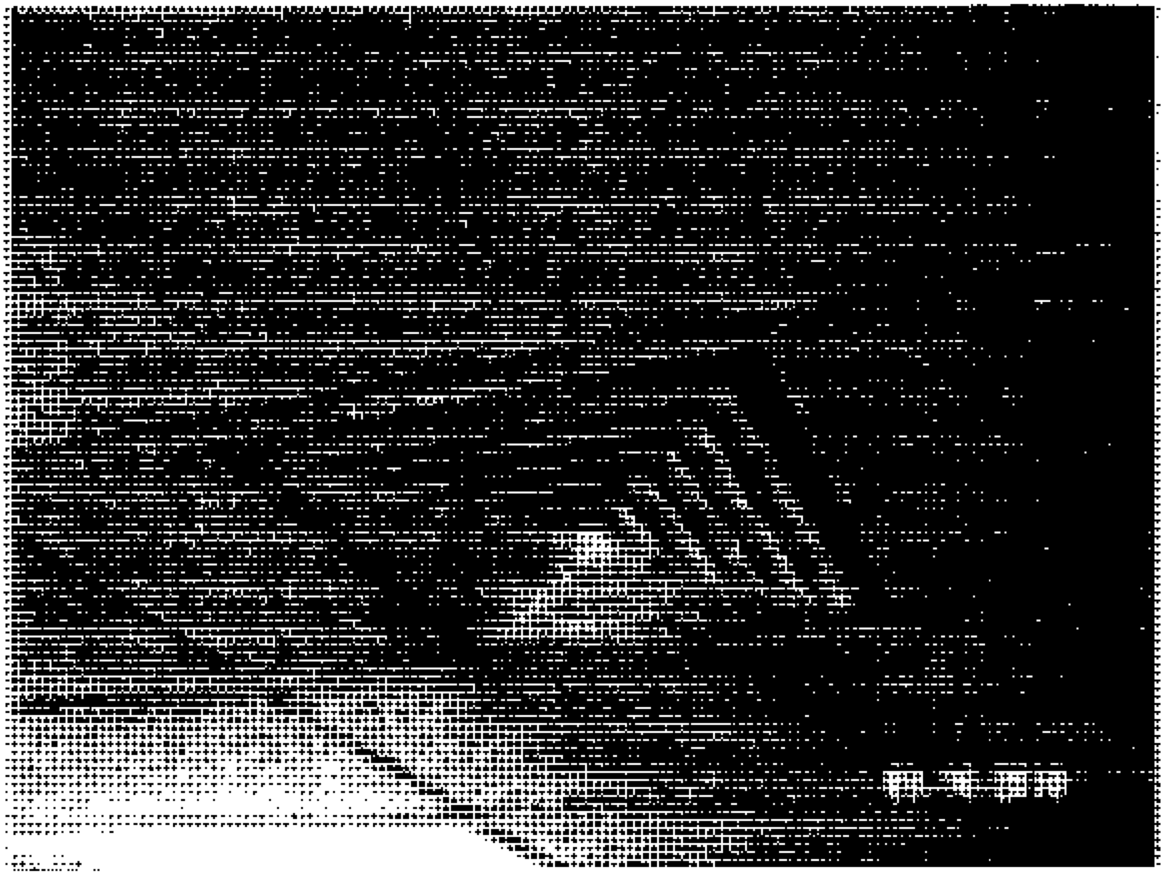


Queen Anne MD
Drill Hall -- Water Damage and Chipping/Peeling Paint on Block Wall

BEST AVAILABLE COPY

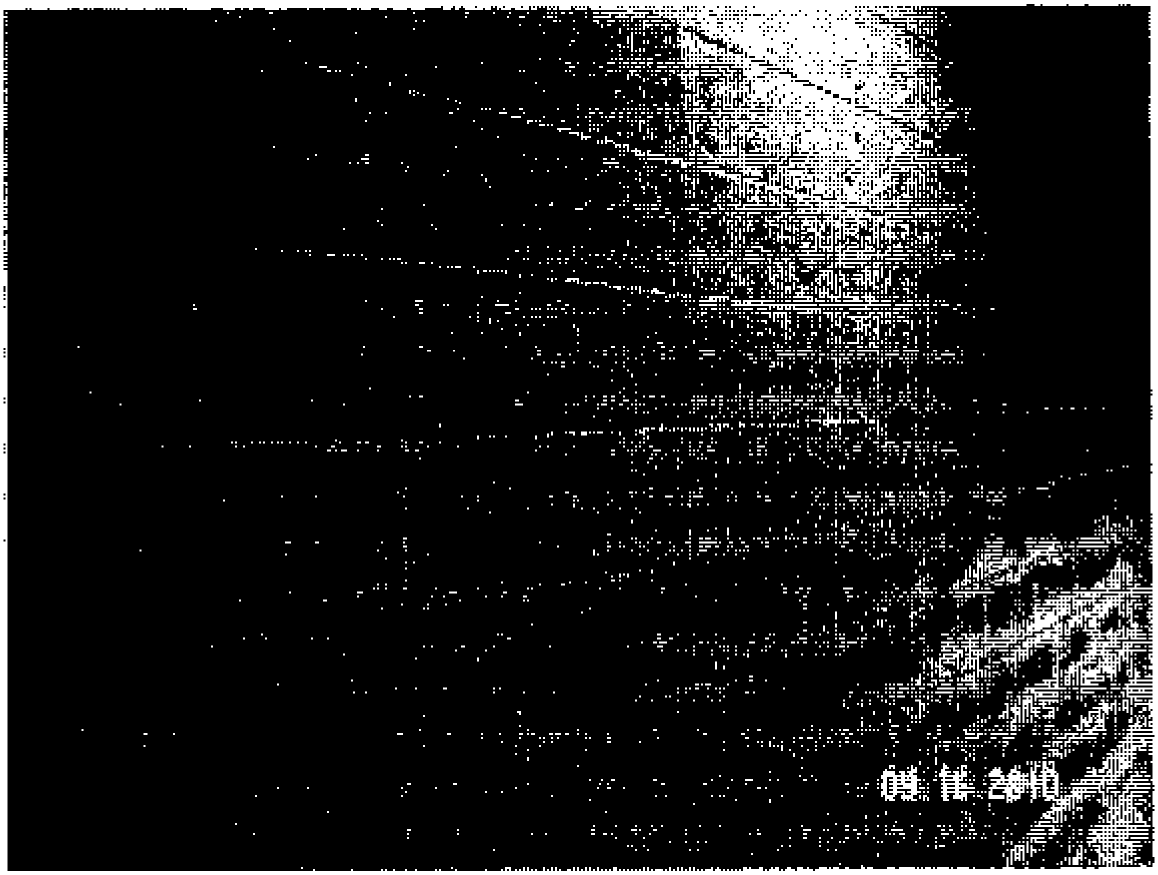


Queen Anne MD
Drill Hall – Water Damage and Efflorescence on Block Wall



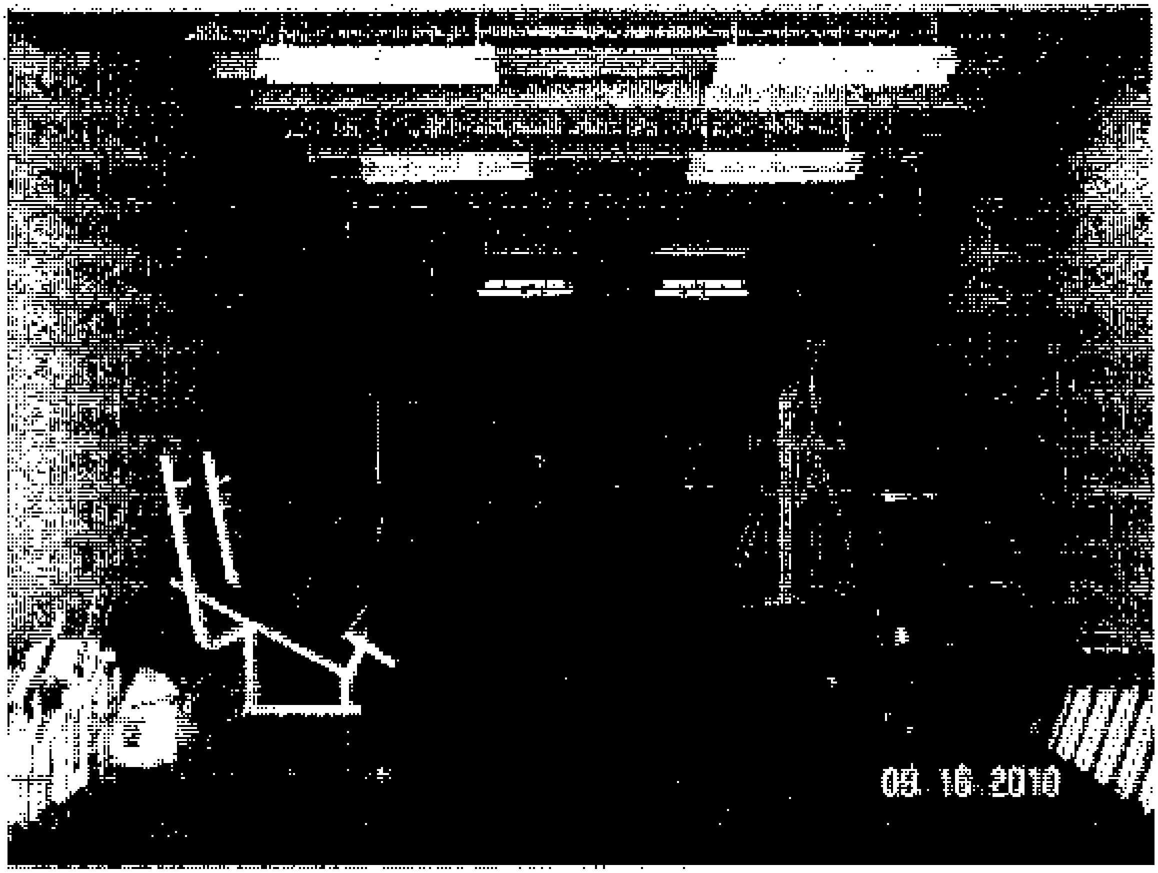
Queen Anne MD
Room 111 Water Damage/Possible Fungal Growth on Ceiling Tile and Supply Vent

BEST AVAILABLE COPY

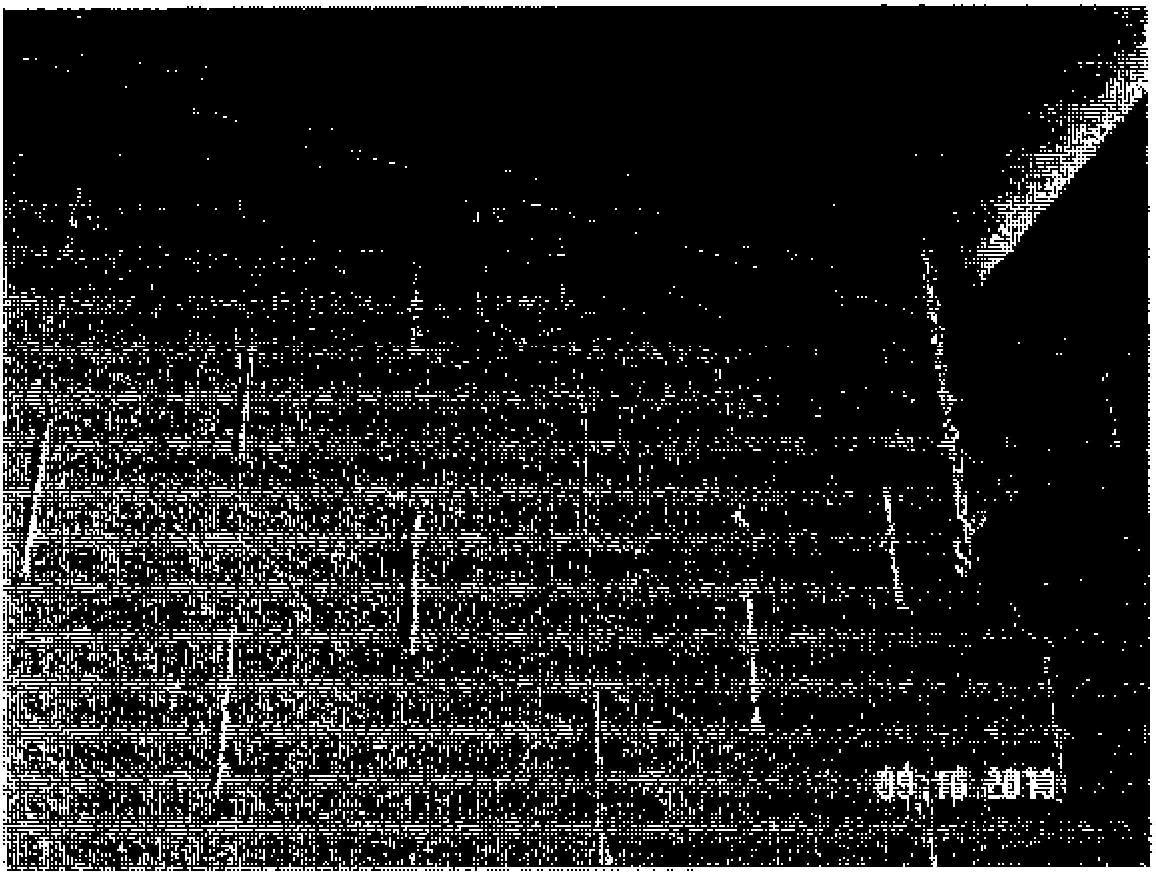


Queen Anne MD
Hallway to Converted Firing Range - Efflorescence on Cement Block Wall

BEST AVAILABLE COPY

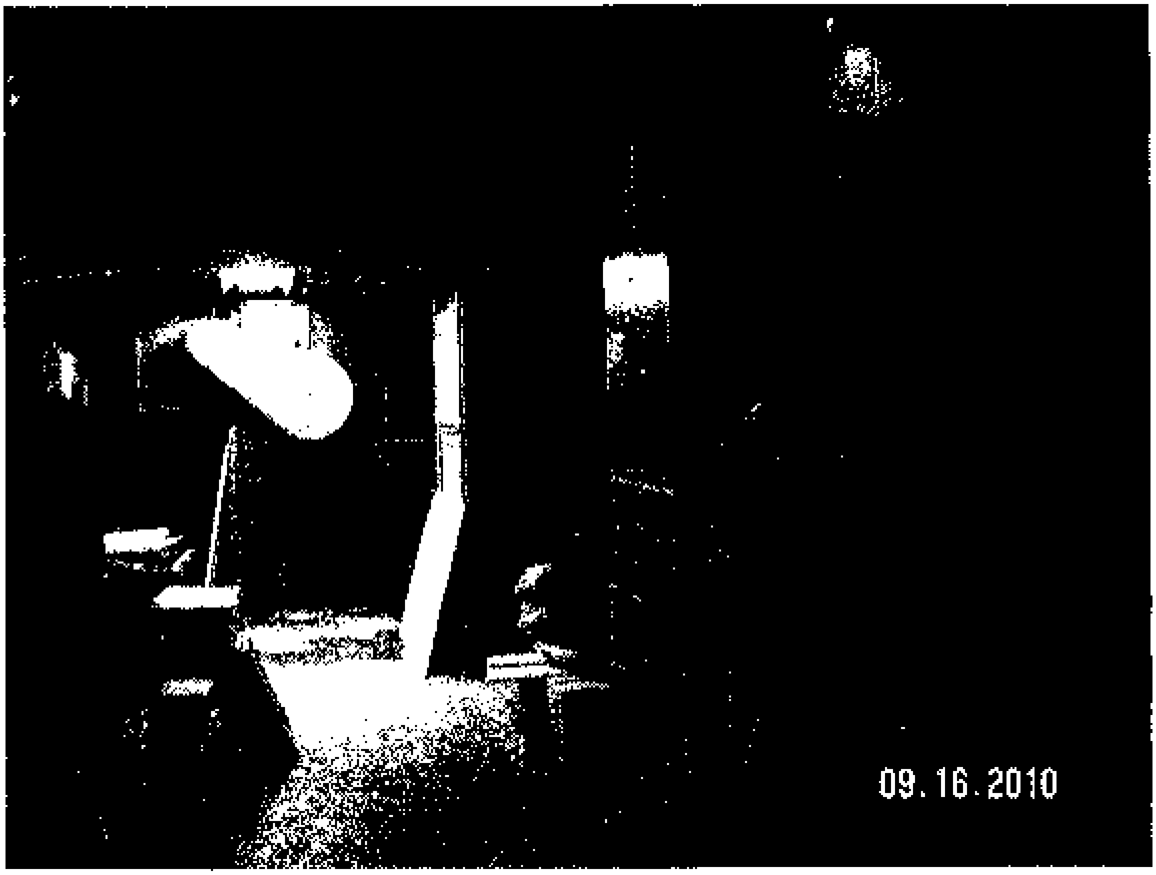


Queen Anne MD
Converted Firing Range

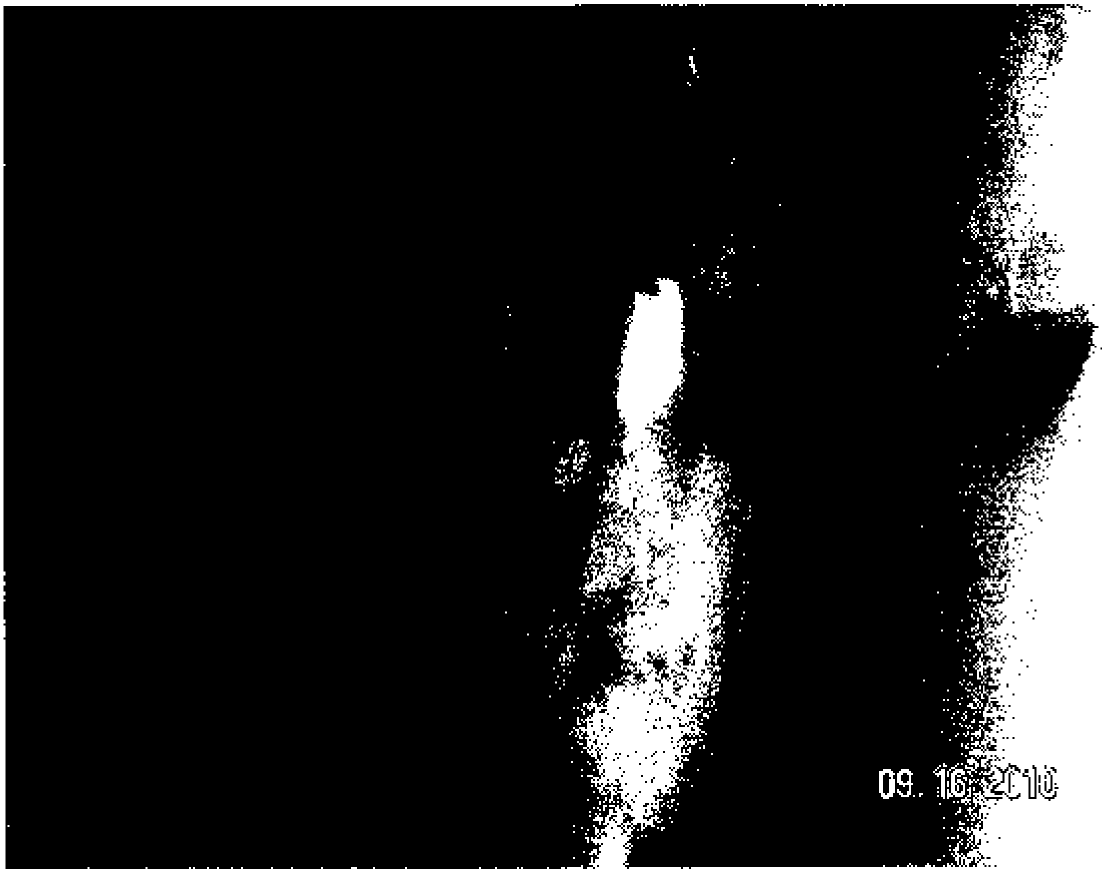


Queen Anne MD
Converted Firing Range - Rust Staining and Efflorescence On Cement Block Wall

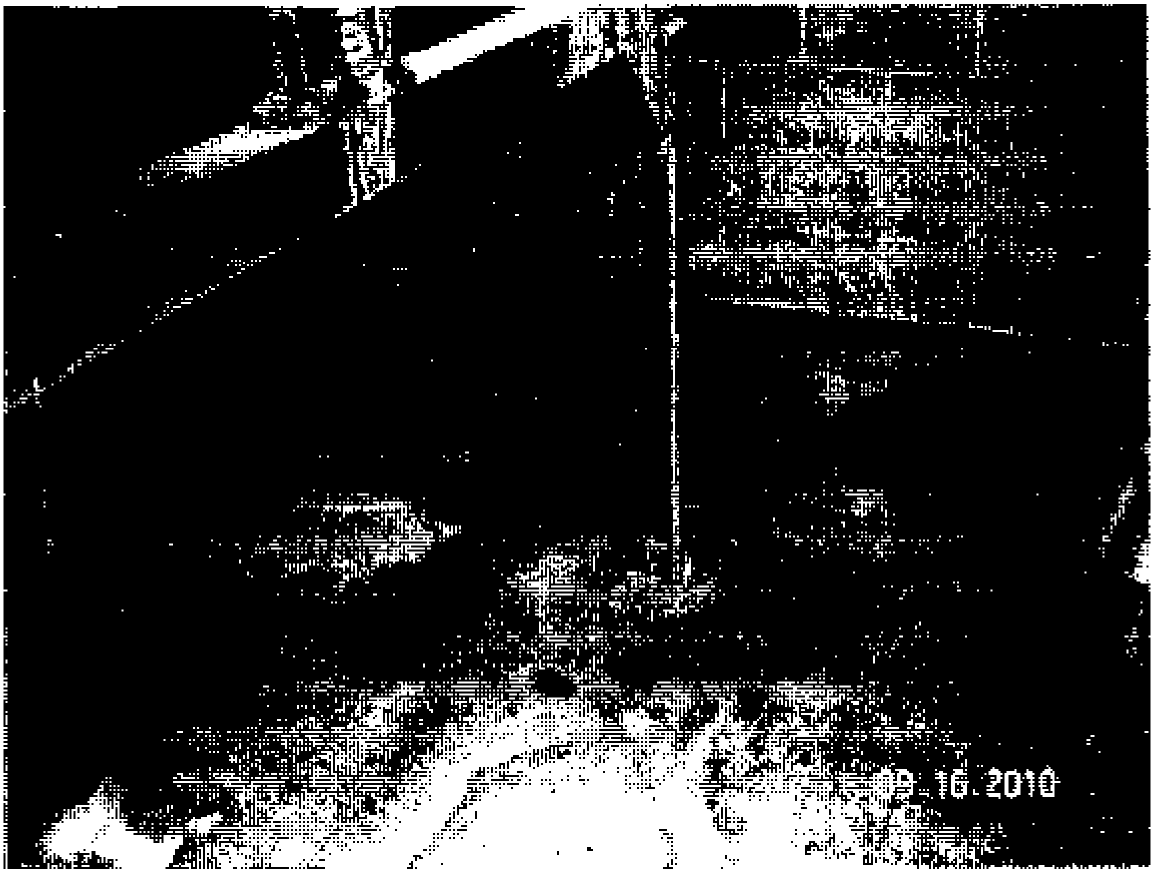
BEST AVAILABLE COPY



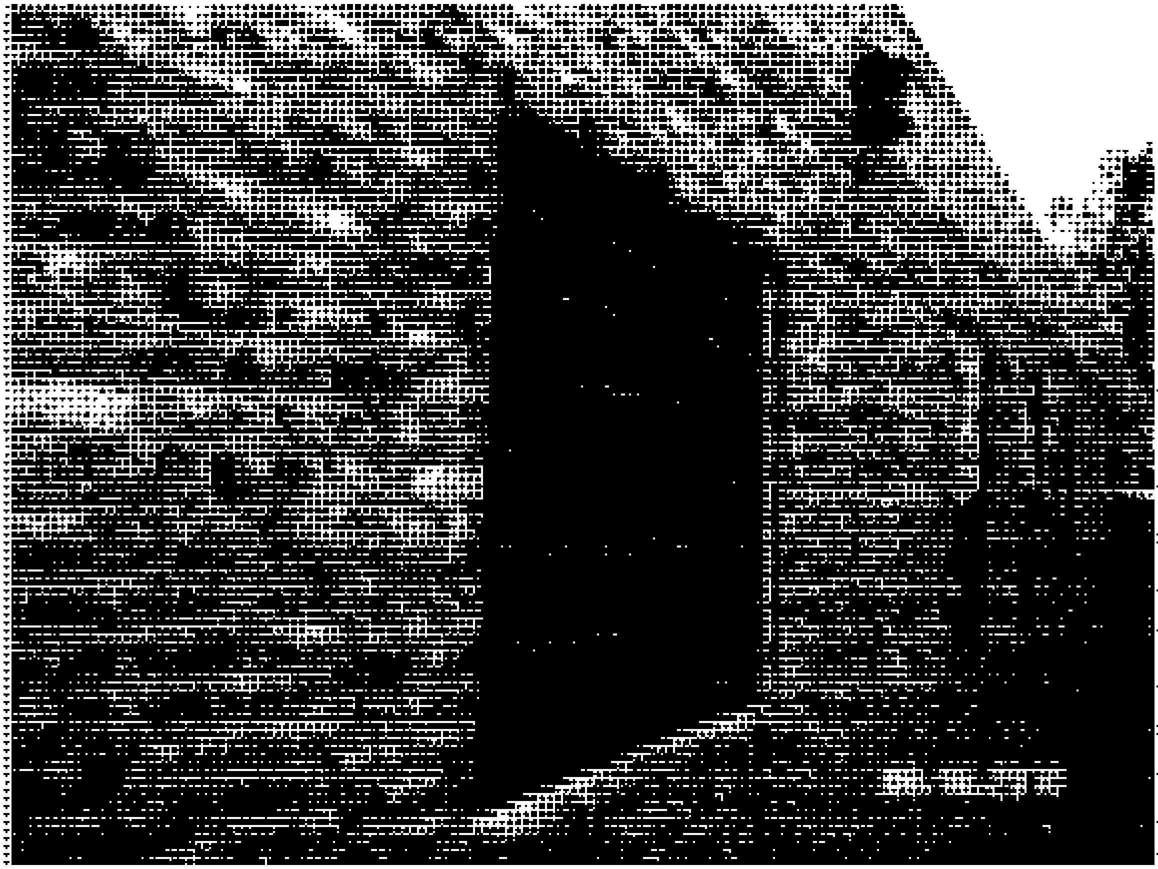
Queen Anne MD
Boiler and AHUs



Queen Anne MD
Boiler Room   Damage Fiberglass Pipe Insulation

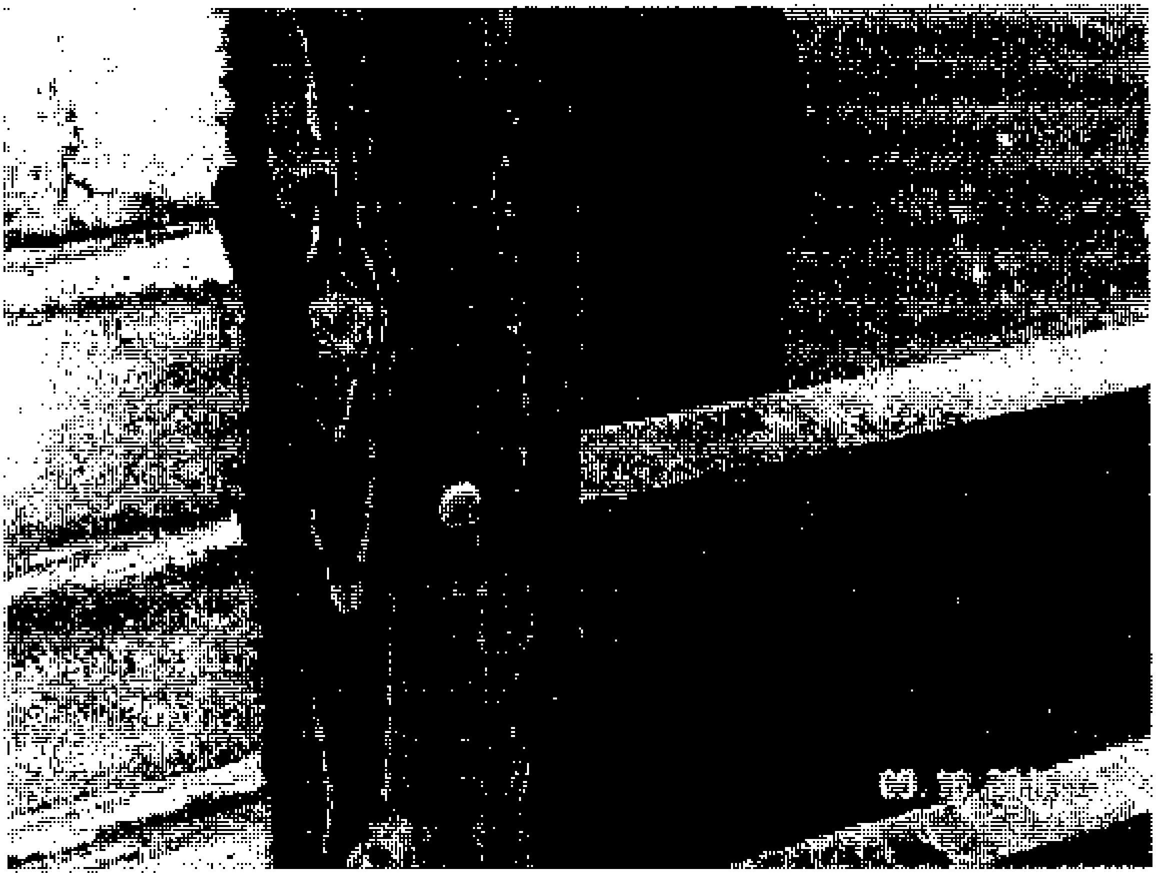


Queen Anne MD
Boiler Room   Standing/Rusty Water on Floor



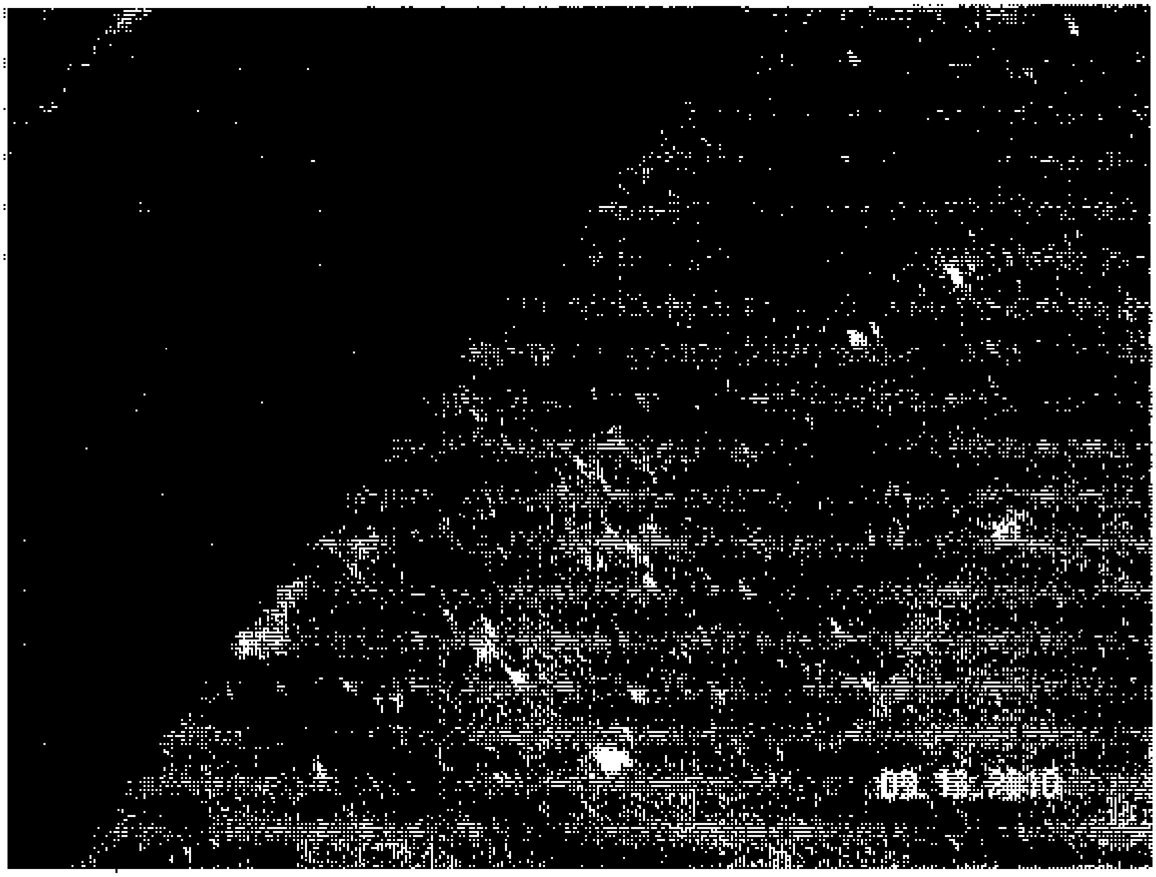
Queen Anne MD
Exterior – Fresh Air Intake

BEST AVAILABLE COPY



Queen Anne MD
Exterior – Possible Asbestos Containing Material   Window Glazing

BEST AVAILABLE COPY



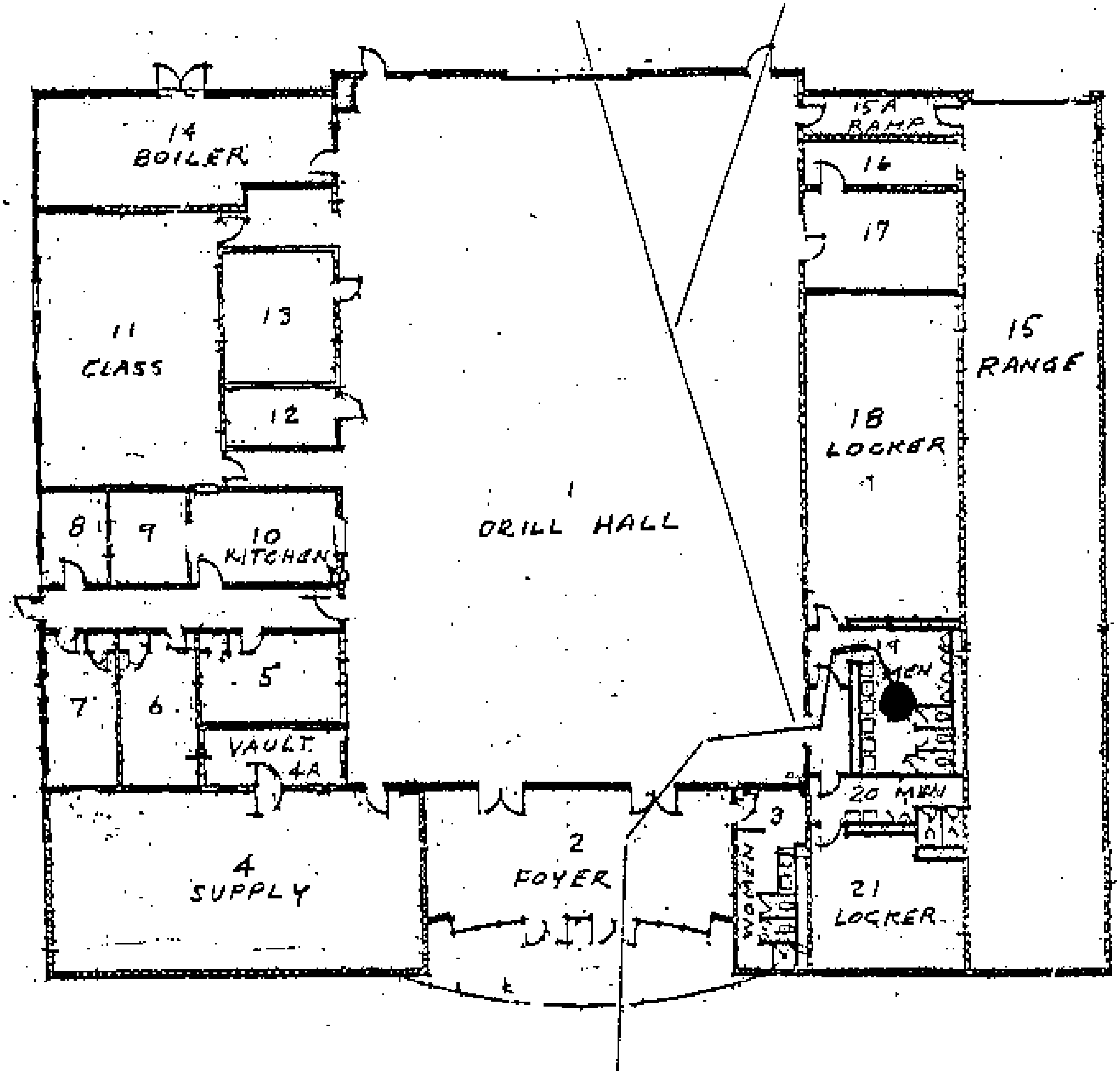
Queen Anne MD
Drill Hall Floor – Visible Powder and Paint Falling from Ceiling from Roof Leak

BEST AVAILABLE COPY

Appendix C
Floor Plan

BEST AVAILABLE COPY

COMPONENT ARNG	FY____ MILITARY CONSTRUCTION PROJECT DATA	2. DATE
3. INSTALLATION AND LOCATION QUEEN ANNE		
4. PROJECT TITLE FIRE ESCAPE ROUTE		5. PROJECT NUMBER



FIRST FLOOR LEVEL

ENLISTED MENS LATRINE AREA 19

Appendix D
References

BEST AVAILABLE COPY

Appendix D. References

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

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

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

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

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

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

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

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

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

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
Queen Anne Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Queen Anne Readiness Center** **3011 Starr Road** **Queen Anne, MD 21657**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**October 2, 2013**
Report Date:	**November 20, 2013**

Non-Responsive

[redacted]

Manager, Industrial Hygiene Services

Table of Contents

Section 1.0 Executive Summary

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

1. Surface levels of lead exceed the recommended guideline of <200 ug/ft^2 at four locations in the converted firing range and the top of the cabinet in Office 112.

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

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

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

    b. The relative humidity levels did not meet the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in two occupied areas sampled.

    c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 parts per million (ppm).

    d. Carbon dioxide (CO_2) levels met the ASHRAE 62.1-2013 recommended guidelines for mechanically ventilated office buildings and commercial settings.

    See Section 5.0 for detailed sampling results.

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

BEST AVAILABLE COPY

Section 2.0 Operation Description & Observations

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

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

The heating system is an oil-fired hot water unit. There is no air conditioning in the facility.

There is no child-care facility in the building.

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

This facility contains a converted firing range being used as a storage area and gym.

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

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

Housekeeping is adequate.

It was reported that the building has several roof leaks.

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

BEST AVAILABLE COPY

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

Table Notes:
1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2 =** micrograms per square foot

4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Sources:
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 exceed the recommended guideline of <200 ug/ft^2 at four locations in the converted firing range and the top of the cabinet in Office 112.

- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/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
Boiler Room	**26.9**	**30**	**No**
Assembly Hall	24.4	10	Yes
Lounge/Classroom 111	51.7	30-50	Yes
Corridor	23.6	5	Yes
Office 105	56.2	30-50	Yes
Office 106	54.3	30-50	Yes
Kitchen-Food Prep	81.5	50	Yes
Office 112	**14.2**	**30-50**	**No**
Office 113	103.2	30-50	Yes
Gym	43.7	30	Yes
Storage Room-Bulk	26.2	10	Yes
Lobby	261.5	10	Yes
Women's Latrine	69.2	5	Yes
Locker Room	65.1	7	Yes
Men's Latrine	13.6	5	Yes
Storage Room-Bulk	21.1	10	Yes

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

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

The lighting levels did not meet the minimum recommended guideline in the Boiler Room and Office 112.

Section 5.0 Indoor Air Quality

Survey measurements were made for comfort parameters and ventilation (temperature, relative humidity, carbon dioxide, and carbon monoxide). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7575-X (Serial #39018). The IAQ Meter was last calibrated in March 2013.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2013). ASHRAE specifies temperature ranges for human comfort (ASHRAE 55-2010). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60%.

The following table summarizes the measurements collected.

IAQ Assessment Summary

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

Table Notes:
1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **°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 were above the recommended guideline of 30 – 60 % in two sampled areas. Relative humidity should remain within the recommended guideline of 30% to 60% in all occupied areas.

- Carbon dioxide levels were measured to evaluate building ventilation or the introduction of outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,058 ppm (700 ppm + 358 ppm). This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide

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

    1. Water damage was observed on the ceiling in the kitchen. In administrative areas, ceiling tiles were missing where water damage had occurred. Sources should be identified and corrected to ensure no further damage occurs.

    2. It was reported that the roof leaks in several places. Sources should be identified and corrected to ensure no further damage occurs.

BEST AVAILABLE COPY

Section 6.0 Suspect Asbestos Containing Building Materials (ACM)

There was no suspect asbestos containing material (ACM) noted at the time of this survey.

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

BEST AVAILABLE COPY

Section 7.0 Equipment

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

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	39018	3/2013	NA
Cal Light 400 Light Meter	98011EL	11/2012	NA
SKC Air Sampling Pump	647631	10/02/13	2.74 LPM
SKC Air Sampling Pump	647610	10/02/13	2.71 LPM

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

Appendix A. Laboratory Analysis Report

BEST AVAILABLE COPY

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

BEST AVAILABLE COPY

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:**	516884
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Queen Anne	**Date Submitted:**	10/7/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	Non-Responsive [redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	10/25/2013 **Report Date:** 10/28/2013

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 (ft^2)	Reporting Limit		Total ug	Final Result		Comments
14001627	1	Flame	Air	493	N/A	6.1	ug/m³	<3	<6.1	ug/m³	
14001628	2	Flame	Air	488	N/A	6.1	ug/m³	<3	<6.1	ug/m³	
14001629	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
14001630	4	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
14001631	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001632	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001633	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001634	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001635	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001636	10	Flame	Wipe	****	0.108	110	ug/ft²	740	6900	ug/ft²	
14001637	11	Flame	Wipe	****	0.108	110	ug/ft²	51	470	ug/ft²	
14001638	12	Flame	Wipe	****	0.108	110	ug/ft²	32	290	ug/ft²	
14001639	13	Flame	Wipe	****	0.108	110	ug/ft²	24	230	ug/ft²	
14001640	14	Flame	Wipe	****	0.108	110	ug/ft²	27	250	ug/ft²	
14001641	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001642	16	Flame	Paint Chip	****	N/A	0.0094	%Pb		<0.0094	%Pb	

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

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

Client:	National Guard Bureau	**Job Name:**	ARNG 4a MD	**Chain Of Custody:**	516884
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Queen Anne	**Date Submitted:**	10/7/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	10/25/2013 **Report Date:** 10/28/2013
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

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

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

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

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

Air and Wipe results are not corrected for any blank results

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

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

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

Analyst: 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) 516884

1 of C
1/C

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: Queen Anne
3. Job #: [redacted] PO #: 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: 10/14/13
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Inclu[redacted] with 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 1 (QTY)
☑ Pb Dust Wipe (wipe type Ghost) 12 (QTY)
☑ Pb Air 3 (QTY)
☐ Pb Soil/Solid ______ (QTY)
☐ Pb TCLP ______ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ______) ______ (QTY)

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

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	WIPE/DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1		10/2/13	493					✓		✓						
2 Assembly Hall			488							✓						
3 BLANK			—							✓						
4 BLANK												✓				
5 Assembly Hall	FLOOR CTR			100 cm²												
6 Kitchen	FRIG TOP															
7 OFFICE 113	CABINET TOP															
8 Locker Room	Locker TOP															
9 FLR outside	CFR DOOR															
10 CFR	FLOOR Bullet Trap END															
11 CFR	LIGHT FIXTURE TOP															
12 CFR	CABINET TOP															

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

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 10 / 7 / 13 @ 830 Via: FedEx By (Print): MCM Sign: ______
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ____ / ____ / ____ Time: ______ Initials: ______
4. Comments: 1963 2770 5666

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

Ste 516884
2 of 2

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

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

Submittal Information:
1. Job Name: ARNG 4aMD
2. Job Location: Queen Anne
3. Job #: Non-Responsive [redacted] PO #: W912K6-09-A-0003
4. Contact Person [redacted]
5. Submitted by: [redacted] Signature: Non-Responsive [redacted]

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

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

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

REPORT TO:
☒ Inclu Non-Responsive [redacted] with Report
☒ Emai [redacted] @complianceplace.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 1 (QTY)
☒ Pb Dust Wipe (wipe type CoHOST) 12 (QTY)
☐ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

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

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	Wipe DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13 CFR FLOOR	INSIDE ENTRANCE	10/2/13		100 cm²				✓				✓				
14 OFFICE 112	CABINET TOP	|		|				|				✓				
15 Break Room	Bookshelf Top	|						|				✓				
16 Wall Paint	Chip CFR RAMP							|			✓					

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

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

BEST AVAILABLE COPY

Appendix B. Photographs

BEST AVAILABLE COPY

Queen Anne RC

Converted Firing Range

Boiler Room

Kitchen Water Damaged Ceiling

Missing Ceiling Tile Reported Water Damage

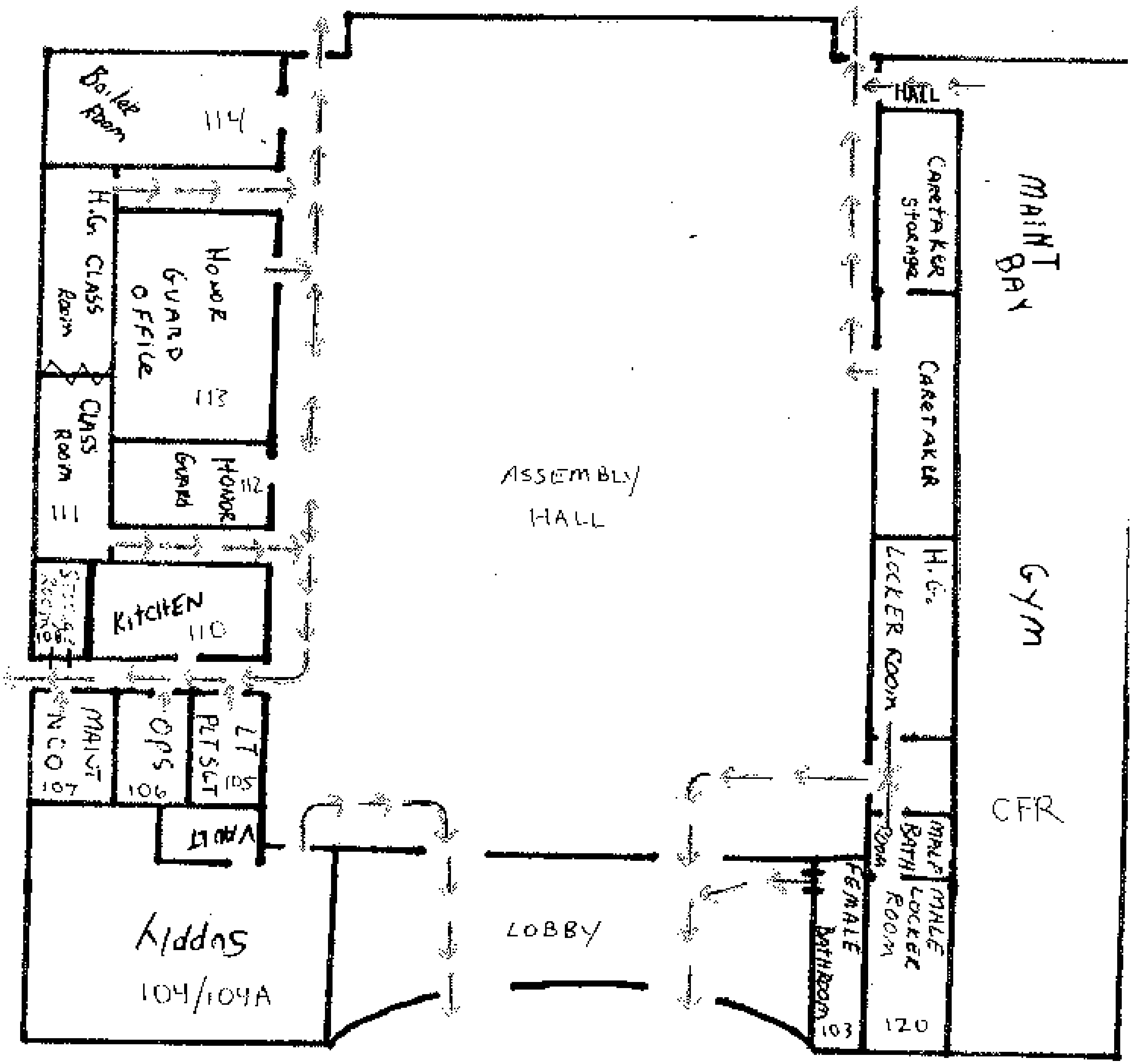
CFR Hallway Peeling Paint

Appendix C. Floor Plan

BEST AVAILABLE COPY

↑N

10/2/13



Queen Anne RC.

Appendix D. References

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

2. American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2013 Edition.

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 28th Edition.

4. American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2013.

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

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

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

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

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

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

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

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

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

BEST AVAILABLE COPY

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 CSM Blair Lee Crockett Armory, Salisbury, MD

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

2. Please direct any additional comments or concerns to Ms. [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

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

Approved for public release; distribution unlimited.

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

Readiness Thru Health

BEST AVAILABLE COPY

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, CSM BLAIR LEE CROCKETT ARMORY
SALISBURY, MD
PROJECT NO. 55-ML-01ED-03

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

2. CONCLUSIONS.

a. Indoor Air Quality. The armory relative humidity of 68.9 % exceeded the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) recommended guidelines for air quality of 30 % to 60 % relative humidity. The indoor temperature of 81.1 degrees Fahrenheit exceeded the ASHRAE recommended guidelines for an acceptable thermal environment of 73 to 79 degrees Fahrenheit in the summer and 68 to 74.5 degrees Fahrenheit in the winter at 50 % relative humidity. Carbon dioxide levels in all rooms with the exception of the locker room (former IFR) met the ASHRAE recommended guidelines. To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room not exceed 700 parts per million (ppm) more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. Therefore the total carbon dioxide level should not exceed approximately 1050 ppm in this armory.

b. Lead. All air samples are below the laboratory analytical detection limit for lead in air of 3.0 to 15.0$\mu g/m^3$, and are below the Occupational Health and Safety Administration (OSHA) standard of 50$\mu g/m^3$ for lead in air. Four dust-lead wipe sample results, located in the locker room (BO5) floor near the back wall (trap area, shooting lane, and lobby area of former range), (880$\mu g/ft^2$) (370$\mu g/ft^2$) (490$\mu g/ft^2$), and (320$\mu g/ft^2$) exceeded the USACHPPM recommended decontamination level of 200$\mu g/ft^2$ for dust-lead on frequently contacted surfaces. Samples collected from the utility room on the floor by the door to the outside (320$\mu g/ft^2$), and from the vehicle maintenance room floor bay 1 (250$\mu g/ft^2$) exceeded the USACHPPM recommended decontamination level of 200$\mu g/ft^2$ for dust-lead on frequently contacted surfaces.

c. Industrial Hygiene and Safety Programs. There is no Hazard Communication Program (HAZCOM) available for full time state workers who have oversight of the armory. They do have personal protective equipment (PPE) but no PPE program. They have material safety data sheets (MSDS) for the vehicle maintenance area of the facility.

Readiness thru Health

3. RECOMMENDATIONS.

a. Indoor Air Quality. The Department of Defense Risk Assessment Codes (RAC) for Health Hazards enables one to prioritize remedial action for hazards. Risk Assessments Codes range in magnitude from 1 to 5, with 1 being the highest priority. The RAC for this armory for Indoor Air Quality is classified as 5. To improve thermal comfort, install more air conditioning units or fans to cool the armory to between 73 and 79 degrees Fahrenheit in the summer. The temperature in the winter should be between 68 and 74.5 degrees Fahrenheit. The indoor temperature of 81.1 degrees Fahrenheit exceeded the ASHRAE recommended guidelines for an acceptable thermal environment. The armory relative humidity of 68.9 % exceeded the recommended ASHRAE guidelines for air quality. USACHPPM recommends either closing the windows and turning on the window air conditioning units or using a portable dehumidifier in the summer months. Carbon dioxide levels in all rooms with the exception of the locker room (former IFR) met the ASHRAE recommended guidelines. To alleviate occupant discomfort and to dilute odors and other pollutants ASHRAE recommends that the carbon dioxide concentration in the room should not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. Check the ventilation system and ensure that the proper level of outdoor air is supplied.

b. Lead. The RAC for Lead Exposure is classified as 5. Many dust-lead sample results exceeded the USACHPPM recommended decontamination level of 200µg/ft^2 for dust-lead on frequently contacted surfaces, as well as the EPA lead exposure levels of 40µg/ft^2 for children for dust-lead on floors. AR 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them. Recleaning and sealing the former firing range area may further prevent exposures for children under six and for the general workforce. Clean all areas in and adjacent to the locker room (BO5) floor (former IFR), the utility room floor, and the vehicle maintenance room floor, bay 1 where sampling results showed elevated levels of lead. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. These actions should be accomplished before allowing children into the area. Recleaning and sealing the IFR may further prevent lead from becoming redistributed into adjacent rooms and resulting in exposures for children and for the general workforce. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities. These workers are required to be in compliance with the OSHA lead in construction standard 29 CFR 1926.62. There is a potential for personnel taking lead contamination out of the workplace into their vehicles and homes. Wear disposable gloves and disposable coveralls as extra protection when working in areas identified as having elevated levels of lead. Test drinking water from water fountains and faucets for lead. Address all potential lead hazards before extending this facility to use for children. If children will be using this facility, clean surfaces to the EPA dust-lead standards for young children of 40µg/ft^2 on floors and 250µg/ft^2 for dust-lead on window sills.

BEST AVAILABLE COPY

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

BEST AVAILABLE COPY

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

TABLE OF CONTENTS

BEST AVAILABLE COPY

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: CSM Blair Lee Crockett Armory, Salisbury, MD

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

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

3. BACKGROUND INFORMATION.

a. Armory Mission. Engineering Support to the 17th Military Police Battalion.

b. Date of Construction. 1958.

c. POC. [redacted] (410) 974-7400 Cell (443) 277-4923.

d. Survey. Date: 04 September 2003.

4. SUMMARY OF ACTIONS.

a. Sampling. Surface dust-lead wipe and lead in air sampling was conducted to determine the existence of lead-based paint and/or lead-based paint hazards (paint-lead hazards). Carbon dioxide, temperature, and relative humidity measurements were collected to determine indoor air quality. Lighting conditions were measured. Sample locations are in Appendix D.

b. Physical Condition of Facilities.

(1) Paint. The paint condition is intact. Sergeant [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. No asbestos was observed.

(3) Mold. No mold was observed.

(4) Safety Hazards. No safety hazards were observed.

c. Other Building Issues. None.

d. Safety and Industrial Hygiene Programs. There are no written program records at the armory. There is no Hazard Communication Program (HAZCOM) available for full time state workers who have oversight of the armory. They do have personal protective equipment (PPE) but no PPE program. They have material safety data sheets (MSDS) for the vehicle maintenance area of the facility.

e. Heating, Ventilation, and Air-conditioning System. There is no central ventilation and HVAC system. Ventilation and air are provided by window-mounted air conditioning units and the manual operation of windows when the building is not being heated.

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

g. Lighting. Lighting was measured in eight locations. Some measurements were taken with the lights off, because the rooms are normally used with the lights off. The list of locations measured and results are provided in Table 2, Appendix D.

h. Converted indoor firing range (IFR). Staff Sergeant Ruth McCuen, Environmental Compliance Assessment Coordinator for the MD NGB, stated that there are no records of a lead abatement for the indoor firing range during its conversion. The IFR has been converted into a locker room and gym.

i. Photographs (Appendix C).

j. Site Maps (Appendix B).

k. Facility use by children. The POC stated that the armory is used extensively by the community and has wide-ranging use by children.

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

6. SAMPLING RESULTS.

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

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

Table 1: Q-Trak Measurements for Indoor Air Quality

Location	Floor	Indoor CO2 Measurement	Outdoor CO2
Operations (BO1)	Basement	395 parts per million (ppm) CO_2	350 ppm CO_2
Locker Room (BO5) (former Range)	Basement	1445 ppm	350 ppm CO_2
Utility Room	Basement	444 ppm	350 ppm CO_2
HHC Orderly Room	First	503 ppm	350 ppm CO_2
Vehicle Maintenance Room (2 bays)	First	359 ppm (outside bay doors open)	350 ppm CO_2
Break room (small kitchen)	First	405 ppm	350 ppm CO_2
Drill Room	First	360 ppm	350 ppm CO_2
Recruiters Office	First	441 ppm	350 ppm CO_2
Main Kitchen	First	364 ppm	350 ppm CO_2
Supply Room (117)	First	500 ppm	350 ppm CO_2
Office HQ 115th MP BN	Second	370 ppm	350 ppm CO_2
Lounge & Training Room	Second	463 ppm	350 ppm CO_2
Office 115th MP BN S2/3	Second	356 ppm	350 ppm CO_2

BEST AVAILABLE COPY

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

Table 2: Lighting Measurements

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

c. Lead. All air samples are below the laboratory analytical detection limit for lead in air of 3.0 to 15.0µg/m³ as well as the Occupational Health and Safety Administration (OSHA) standard of 50µg/m³ for lead in air. Four dust-lead wipe sample results, located in the locker room (BO5) floor near the back wall (trap area of former range), exceeded the USACHPPM recommended decontamination level of 200µg/ft² for dust-lead on frequently contacted surfaces (photo #s 0974-0977). Samples collected from the utility room, the floor by the door to the outside (0978) and the vehicle maintenance room floor (0985), bay 1, exceeded the USACHPPM recommended decontamination level of 200µg/ft² for dust-lead on frequently contacted surfaces. (See Table 2).

BEST AVAILABLE COPY

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

Table 3 Lead Air and Dust Wipe Samples

Sample Numbers	Type of Sample	Location	Floor	Photo #	Result
SA W01	Wipe	Locker Room (BO5), floor, near back wall (trap area of former range)	Basement	0974	880 µg/ft²
SA W02	Wipe	Locker Room (BO5), floor, 15ft from back wall (shooting lane of former range)	Basement	0975	370 µg/ft²
SA W03	Wipe	Locker Room (BO5), floor, 30ft from back wall (shooting lane of former range)	Basement	0976	490 µg/ft²
SA W04	Wipe	Locker Room (BO5) (Gym area), floor, 15ft from entrance door (lobby area of former range)	Basement	0977	180 µg/ft²
SA W05	Wipe	Utility Room, floor by door to outside	Basement	0978	320 µg/ft²
SA W06	Wipe	OPS Room (BO1), floor, far wall under typewriter position	Basement	0979	13 µg/ft²
SA W07	Wipe	Office HQ 117th MP BN, desk top, far corner by supply closet	Second	0981	1.9 µg/ft²
SA W08	Wipe	Office S2/3 window sill	Second	0982	14 µg/ft²
SA W09	Wipe	Lounge & Training Room top of bar	Second	0983	1.6 µg/ft²
SA W10	Wipe	Lounge & Training Room top of table back of room	Second	0984	4.4 µg/ft²
SA W11	Wipe	Vehicle Maintenance Room, floor, bay1	First	0985	250 µg/ft²
SA W12	Wipe	Drill Room, floor, next to back wall	First	0986	12 µg/ft²
SA W13	Wipe	Drill Room, floor, center court	First	0987	11 µg/ft²
SA W14	Wipe	Drill Room, floor, near orderly room	First	0988	3.1 µg/ft²
SA W15	Wipe	Break room (small kitchen), counter top near window	First	0990	< 2.8 µg/ft²
40903RR07	Air	Supply Office (117)	First	0980	<12 mg/m³
40903RR08	Air	Operation Office (BO1)	Basement	0989	<12 mg/m³

7. DISCUSSION AND CONCLUSIONS.

a. The armory relative humidity of 68.9 % exceeded the ASHRAE recommended guidelines for air quality of 30 to 60 % relative humidity. The indoor temperature of 81.1 degrees Fahrenheit exceeds the ASHRAE recommended guidelines for an acceptable thermal environment which are between 73 to 79 degrees Fahrenheit in the summer and between 68 and 74.5 degrees Fahrenheit in the winter at 50 % relative humidity.
Carbon dioxide levels in all rooms with the exception of the locker room (former IFR) met the ASHRAE recommended guidelines. The indoor carbon dioxide levels ranged from 356-1445 ppm. To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. Therefore the total carbon dioxide level should not exceed approximately 1050 ppm in this armory.

b. All air samples are below the laboratory analytical detection limit for lead in air of 3.0 to 15.0µg/m^3. They are also below the Occupational Health and Safety Administration (OSHA) standard of 50µg/m^3 for lead in air. Four dust-lead wipe sample results, located in the locker room (BO5) floor near the back wall (trap area, shooting lane, and lobby area of former range), (880µg/ft^2) (370µg/ft^2) (490µg/ft^2), and (320µg/ft^2) exceeded the USACHPPM recommended decontamination level of 200µg/ft^2 for dust-lead on frequently contacted surfaces (photo #s 0974-0977). Samples collected from the utility room on the floor by the door to the outside (0978) (320µg/ft^2), and from the vehicle maintenance room floor bay 1 (0985) (250µg/ft^2) exceeded the USACHPPM recommended decontamination level of 200µg/ft^2 for dust-lead on frequently contacted surfaces. All these sample results exceeded the EPA lead exposure levels of 40µg/ft^2 for children for dust-lead on floors. AR 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them.

c. There is no Hazard Communication Program (HAZCOM) available for full time state workers who have oversight of the armory. They do have personal protective equipment (PPE) but no PPE program. They have material safety data sheets (MSDS) for the vehicle maintenance area of the facility.

8. RECOMMENDATIONS. Enclosure.

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

BEST AVAILABLE COPY

ENCLOSURE

SALISBURY ARMORY RECOMMENDATIONS

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

1. Lead Exposure. RAC 5.

a. Clean all areas in and adjacent to the locker room (BO5) floor (former IFR), the utility room floor, and the vehicle maintenance room floor, bay 1 where sampling results showed elevated levels of lead. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. Apply a sealant to the area. These actions should be accomplished before allowing children into the area. Recleaning and sealing the IFR may further prevent lead from becoming redistributed into adjacent rooms and resulting in exposures for children and for the general workforce.

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

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

d. Test drinking water from water fountains and faucets for lead. It could not be determined if this has been done.

e. Address all potential lead hazards before extending this facility to use for children. If children will be using this facility, clean surfaces to the EPA dust-lead standards for young children of 40μg/ft^2 on floors and 250μg/ft^2 for dust-lead on window sills.

2. Indoor Air Quality. RAC 5.

a. Install more air conditioning units or fans to cool the armory to between 73-79 degrees Fahrenheit in the summer. The temperature in the winter should be between 68-74.5 degrees Fahrenheit. The indoor temperature of 81.1 degrees Fahrenheit exceeds the ASHRAE recommended guidelines for an acceptable thermal environment.

b. The armory relative humidity of 68.9 % exceeds the ASHRAE recommended guidelines for air quality which are between 30%- 60 %. USACHPPM recommends either closing the windows and turning on the window air conditioning units or using a portable dehumidifier in the summer months.

c. Check the ventilation system and ensure that the proper level of outdoor air is supplied. Carbon dioxide levels in all rooms with the exception of the locker room (former IFR) met the ASHRAE recommended guidelines. To alleviate occupant discomfort and to dilute odors and other pollutants ASHRAE recommends that the carbon dioxide concentration in the room should not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. RAC 5.

3. Additional Recommendations.

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

b. Conduct a complete health hazard assessment inventory of the vehicle maintenance shop.

BEST AVAILABLE COPY

APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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

APPENDIX B

SITE MAPS

BEST AVAILABLE COPY

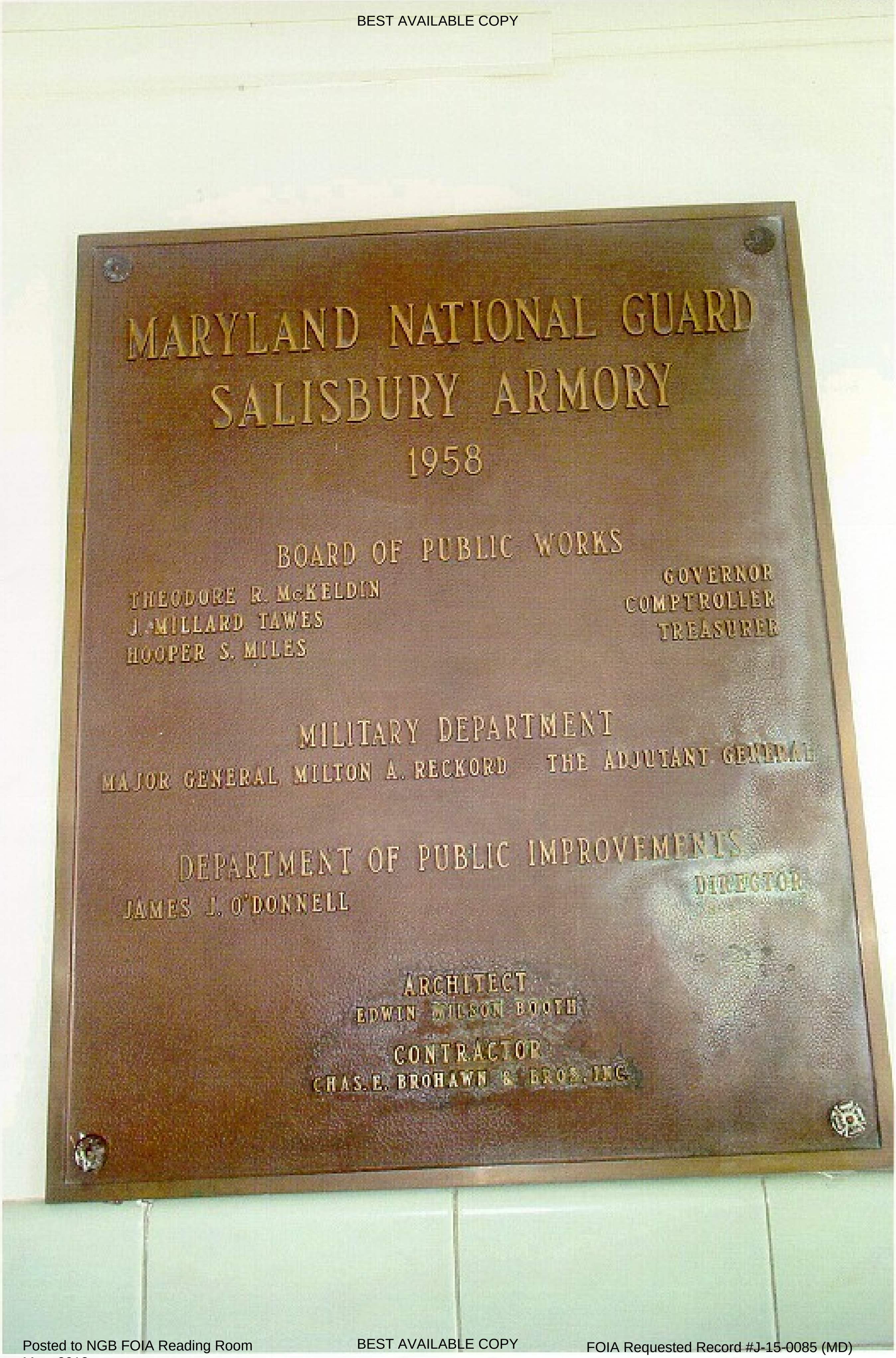
MDARNG Facilities IH Baseline Surveys CSM Blair Lee Crockett Armory, Salisbury, MD
Project No. 55-ML-01ED-03

APPENDIX C

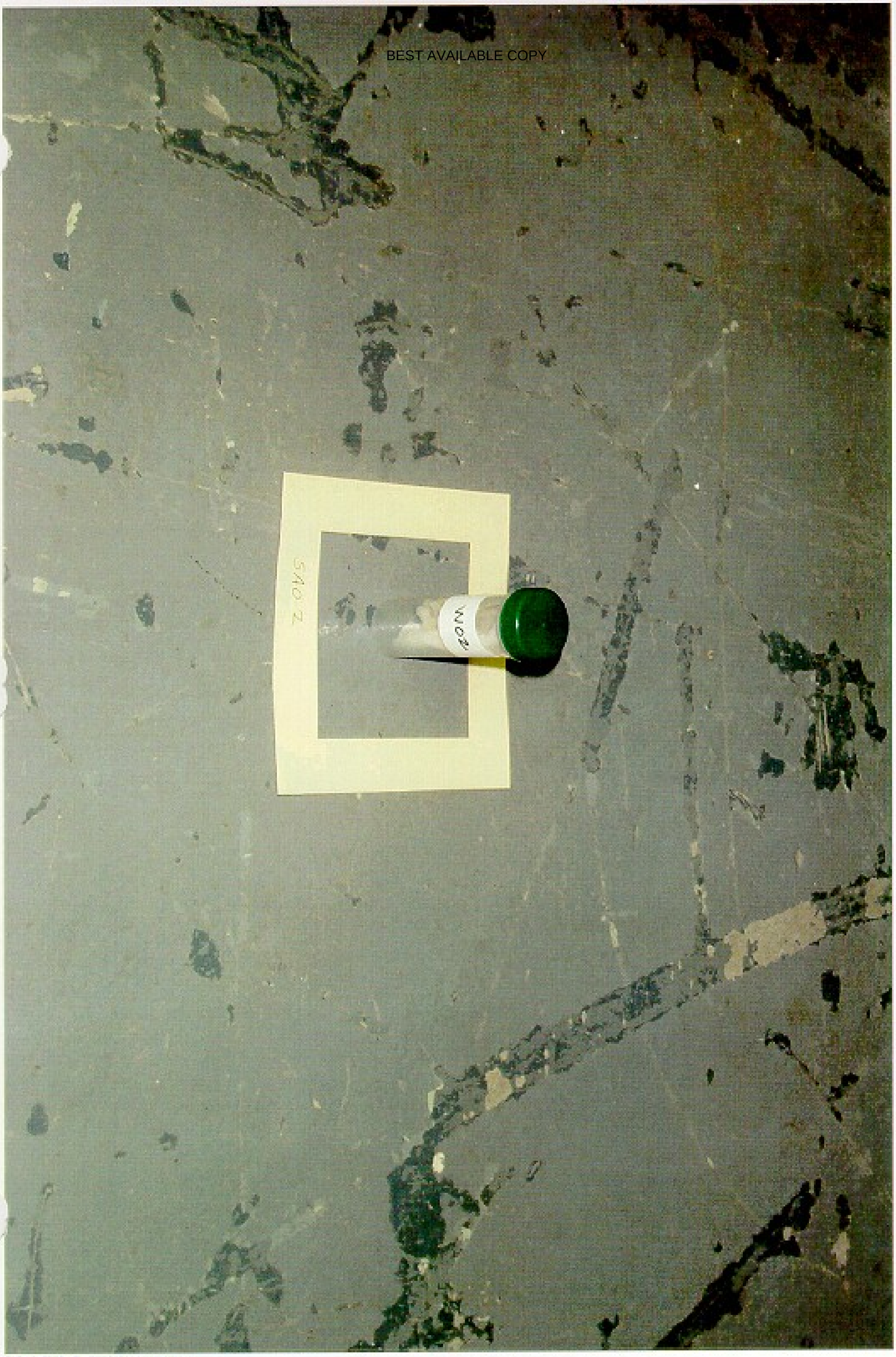
PHOTOGRAPHS

BEST AVAILABLE COPY

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

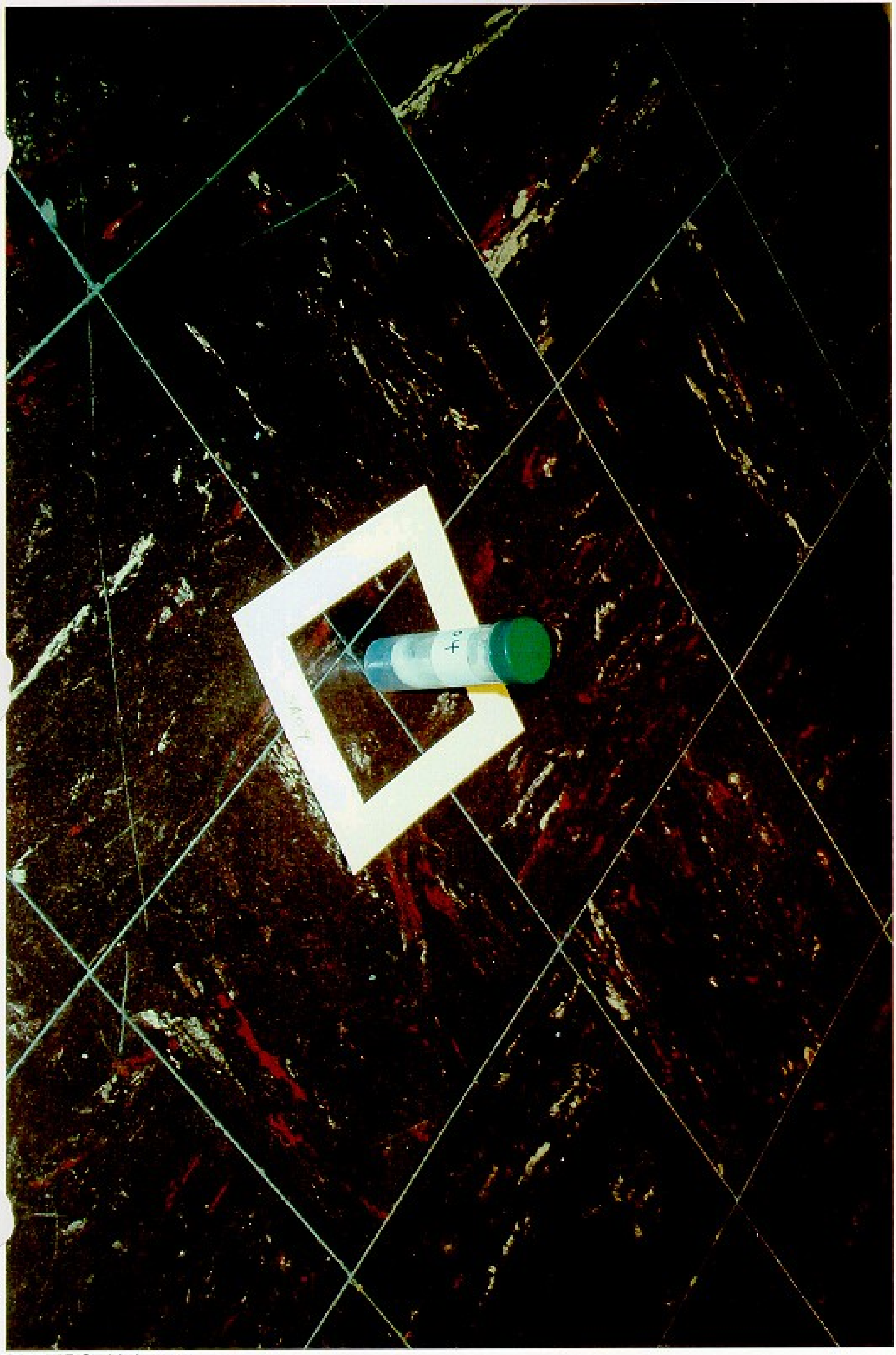

MARYLAND NATIONAL GUARD
SALISBURY ARMORY
1958
BOARD OF PUBLIC WORKS
THEODORE R. McKELDIN GOVERNOR
J. MILLARD TAWES COMPTROLLER
HOOPER S. MILES TREASURER
MILITARY DEPARTMENT
MAJOR GENERAL MILTON A. RECKORD THE ADJUTANT GENERAL
DEPARTMENT OF PUBLIC IMPROVEMENTS
JAMES J. O'DONNELL DIRECTOR
ARCHITECT
EDWIN WILSON BOOTH
CONTRACTOR
CHAS. E. BROHAWN & BROS. INC.

DCP_0974.JPG, Unknown



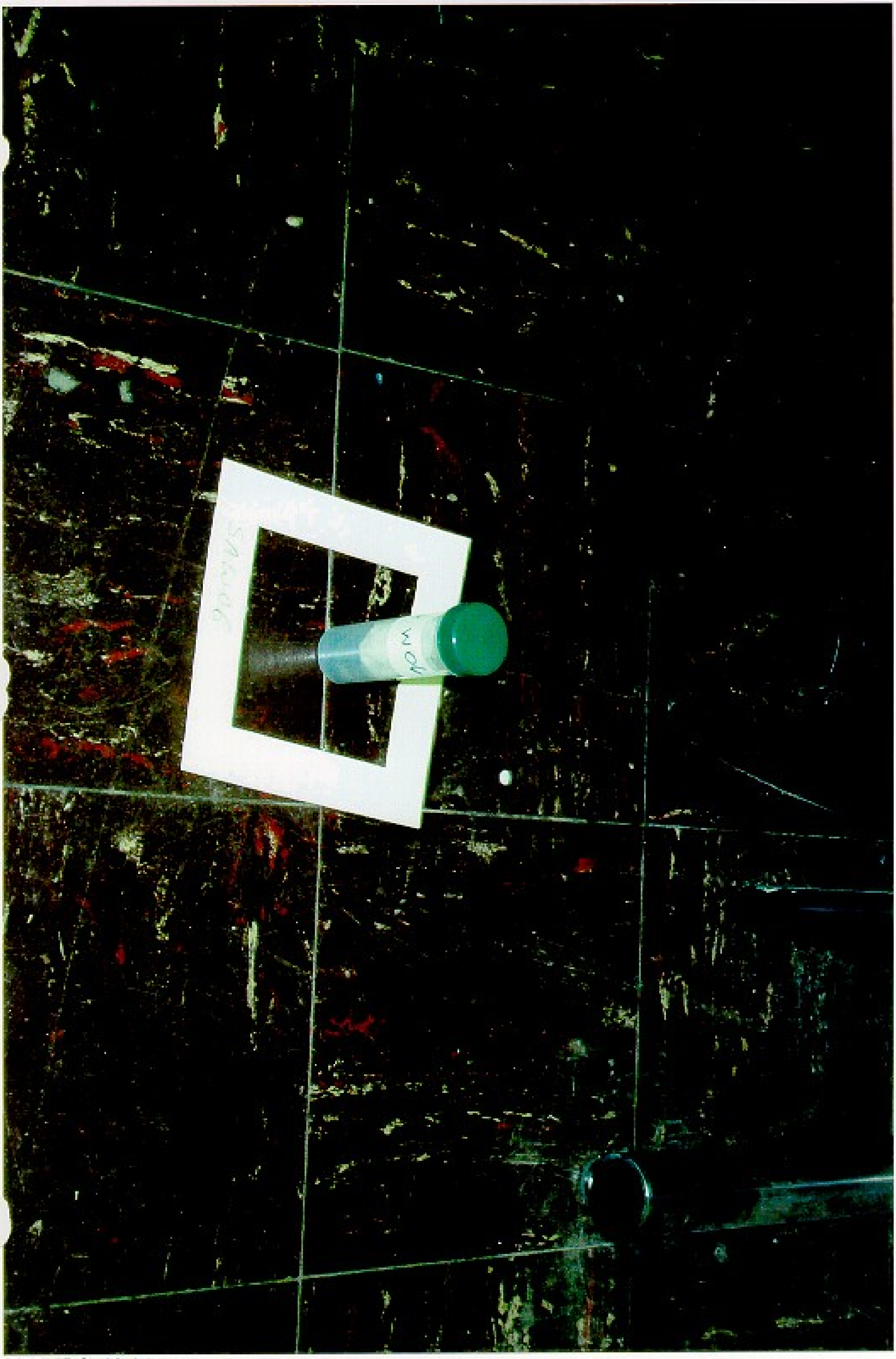
DCP_0975.JPG, Unknown

DCP_0976.JPG, Unknown



DCP_0977.JPG, Unknown

DCP_0978.JPG Unknown



DCP_0979.JPG, Unknown

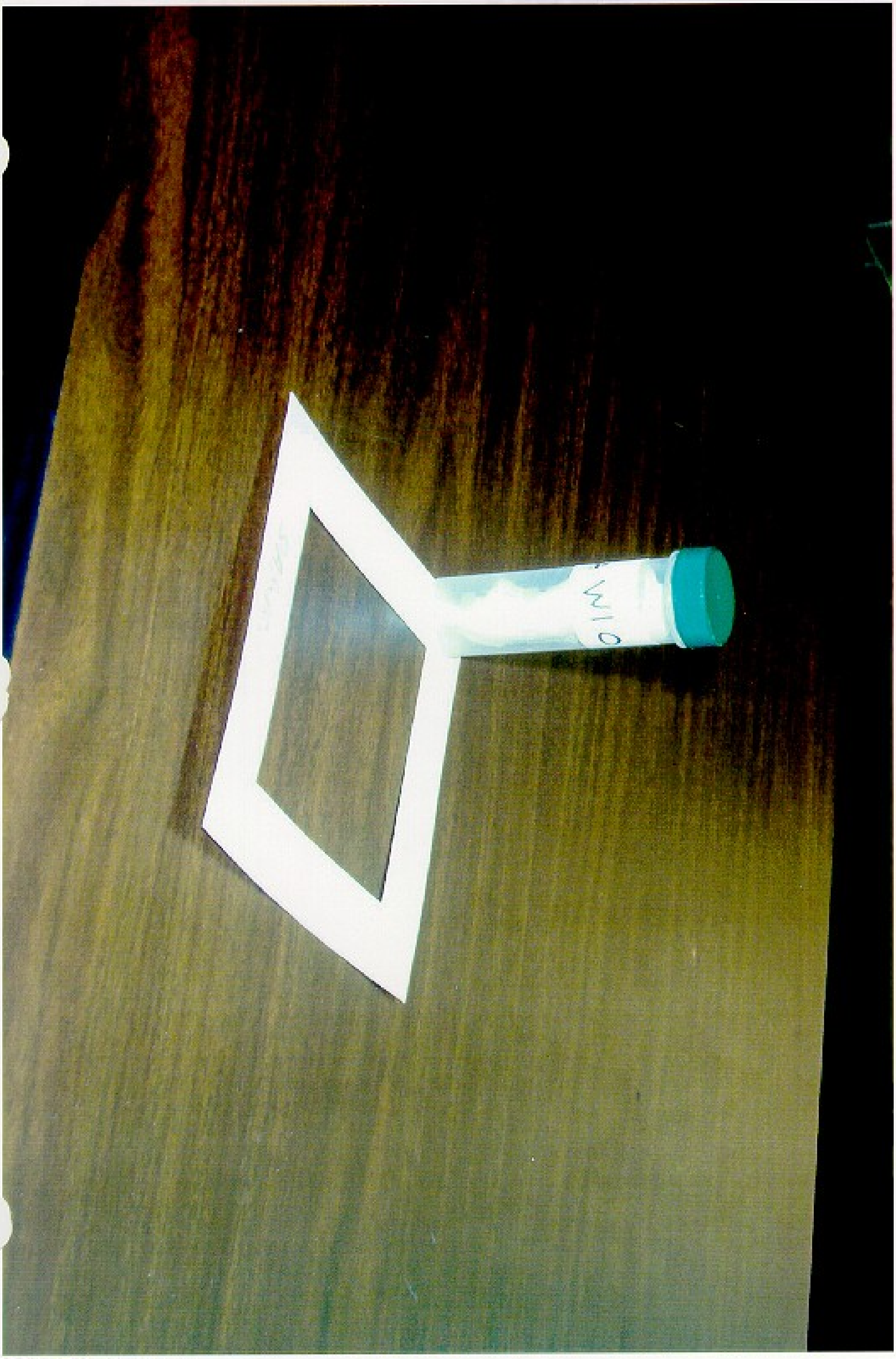
DCP_0980.JPG, Unknown

DCP_0981.JPG, Unknown

BEST AVAILABLE COPY

DCP_0982.JPG, Unknown

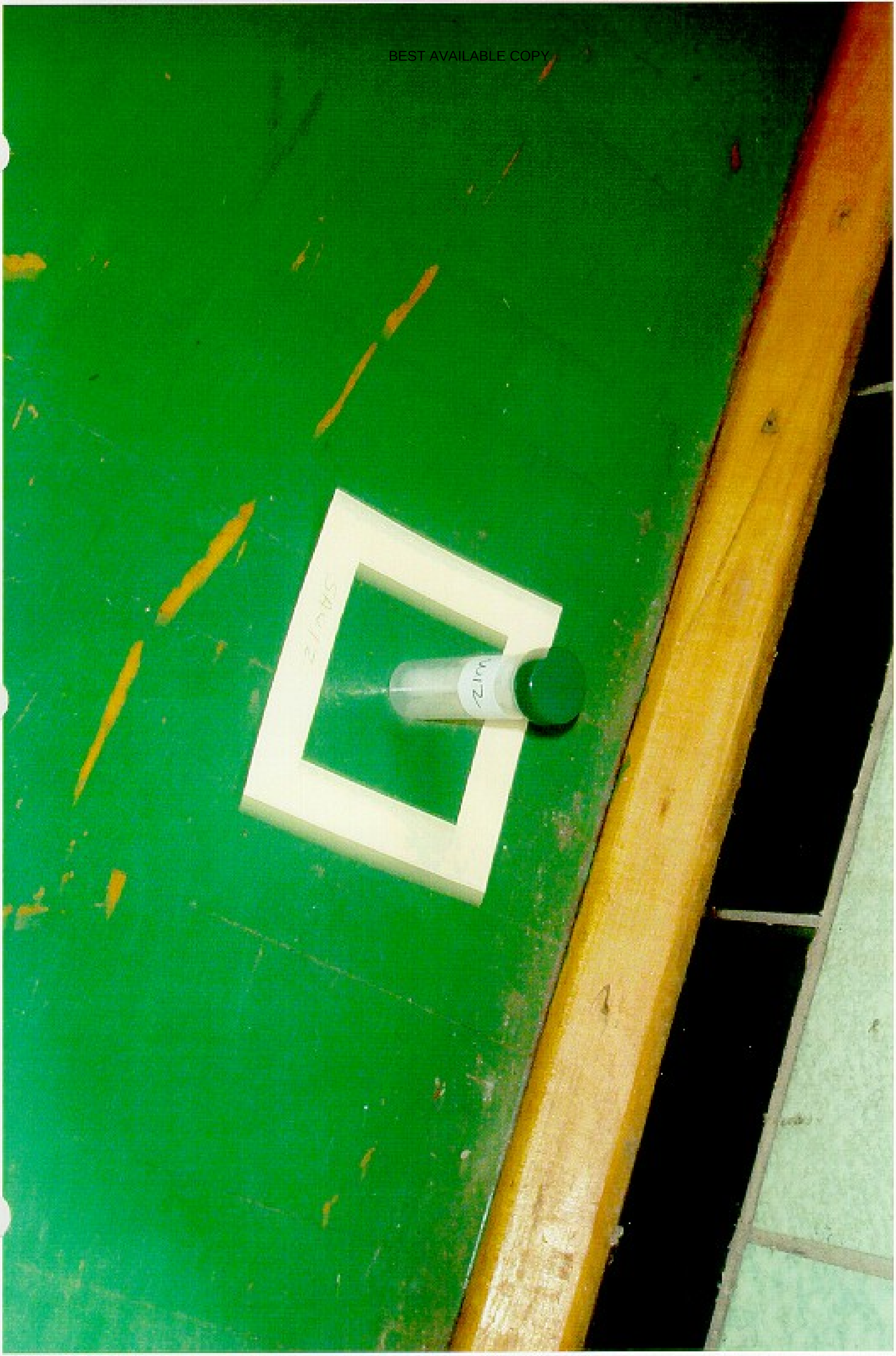
DCP_0983.JPG, Unknown



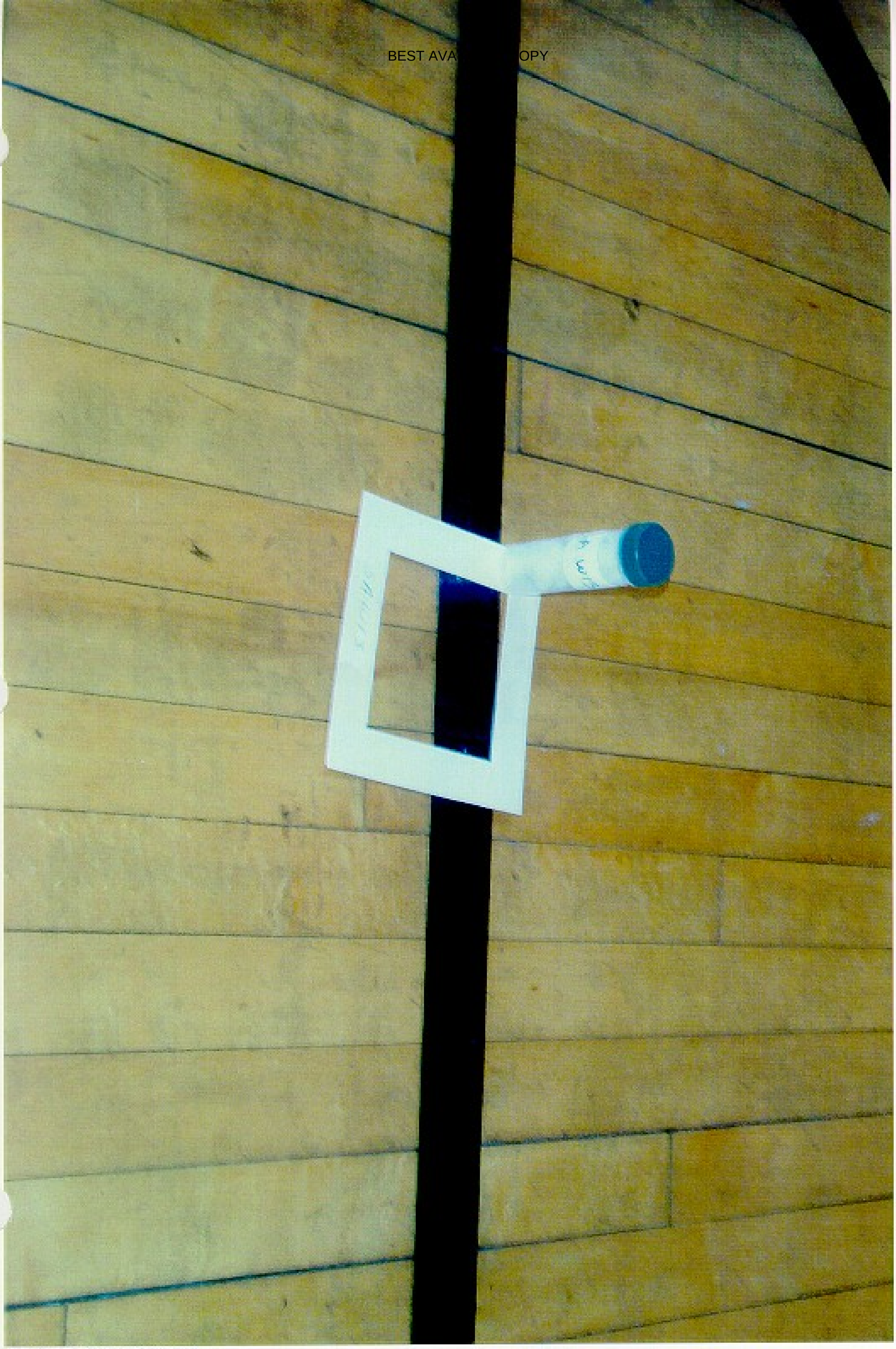
DCP_0984.JPG, Unknown

DCP_0985.JPG Unknown

BEST AVAILABLE COPY



DCP_0986.JPG, Unknown



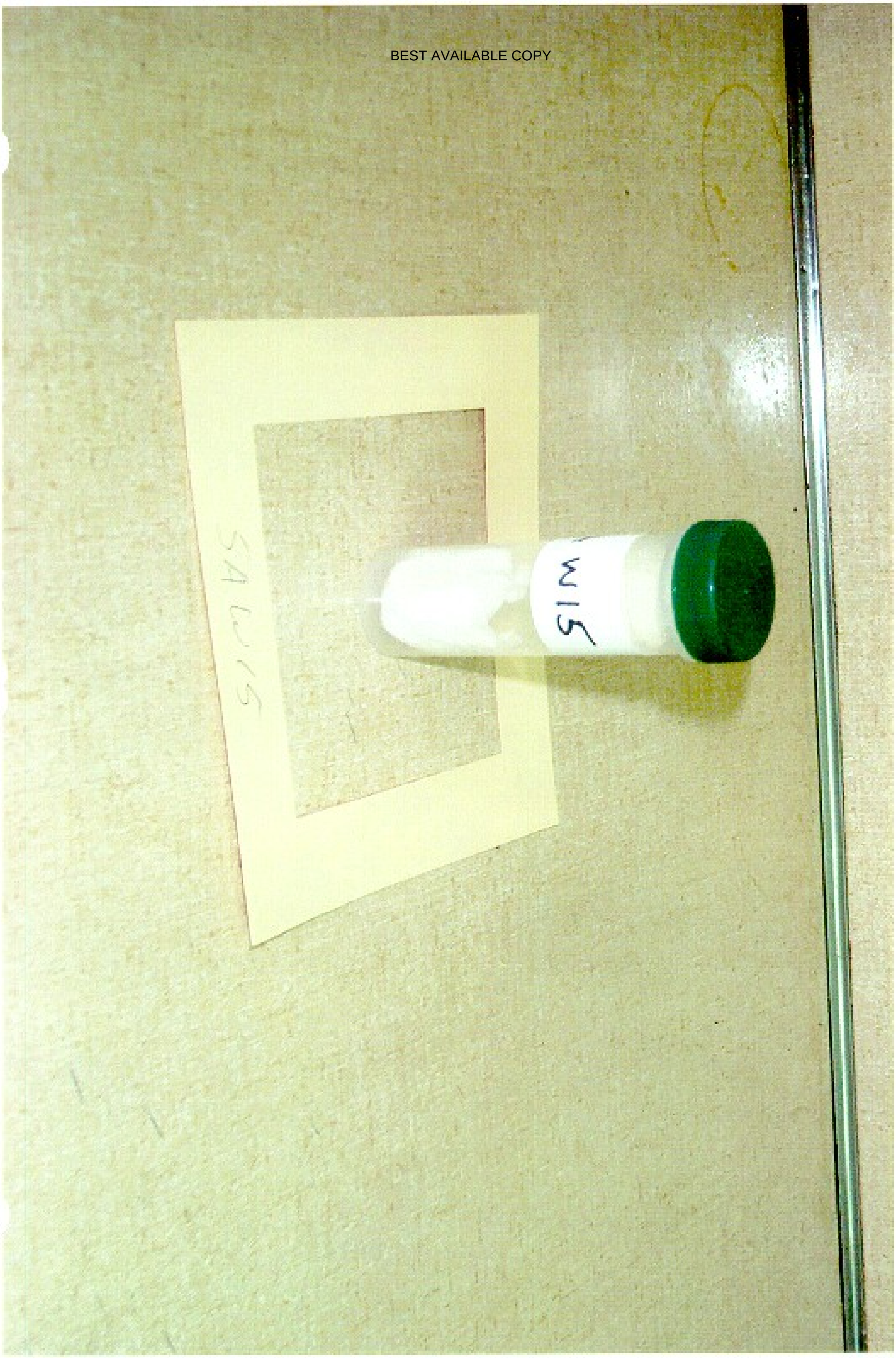
DCP_0987.JPG Unknown

DCP_0988.JPG, Unknown

DCP_0989.JPG Unknown

DCP_0990.JPG, Unknown

BEST AVAILABLE COPY



DCP_0991.JPG, Unknown

BEST AVAILABLE COPY

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

APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

BEST AVAILABLE COPY

			Indoor Range Info						
Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Floor	Conc. (μg/ft²)
				Yes		Yes			
SA W01	Salisbury	Salisbury					Locker Room (BO5), floor, near back wall (trap area of former range)	Basement	880
SA W02	Salisbury	Salisbury					Locker Room (BO5), floor, 15ft from back wall (shooting lane of former range)	Basement	370
SA W03	Salisbury	Salisbury					Locker Room (BO5), floor, 30ft from back wall (shooting lane of former range)	Basement	490
SA W04	Salisbury	Salisbury					Locker Room (BO5) (Gym area), floor, 15ft from entrance door (lobby area of former range)	Basement	180
SA W05	Salisbury	Salisbury					Utility Room, floor by door to outside	Basement	320
SA W06	Salisbury	Salisbury					OPS Room (BO1), floor, far wall under typewriter position	Basement	13
SA W07	Salisbury	Salisbury					Office HQ 117th MP BN, desk top, far corner by supply closet	Second	1.9
SA W08	Salisbury	Salisbury					Office S2/3 window sill	Second	14
SA W09	Salisbury	Salisbury					Lounge & Training Room top of bar	Second	1.6
SA W10	Salisbury	Salisbury					Lounge & Training Room top of table back of room	Second	4.4
SA W11	Salisbury	Salisbury					Vehicle Maintenance Room, floor, bay1	First	250
SA W12	Salisbury	Salisbury					Drill Room, floor, next to back wall	First	12
SA W13	Salisbury	Salisbury					Drill Room, floor, center court	First	11
SA W14	Salisbury	Salisbury					Drill Room, floor, near orderly room	First	3.1
SA W15	Salisbury	Salisbury					Break room (small kitchen), counter top near window	First	<2.8

AMA A[redacted]tical Services, Inc.
A Specialized Environmental Laboratory

BEST A[redacted]OPY

CERTIFICATE [redacted] ANALYSIS

[redacted]VLAP
NY ELAP
AIHA

Client:	US Army - CHPPM	**Job Name:**	MD ARNG Salisbury	**Chain Of Custody:**	117741
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	09/17/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	Non-Responsive
		P.O. Number:	Not Provided	**Report Date:**	17-Sep-03
Attention:	Non-Responsive				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments
0368024	SA Blank 1	Furnace	Wipe Blank	****	N/A	0.15 ug	< 0.15 ug	
0368025	SA W01	Furnace	Wipe	****	0.108	139.41 ug/ft²	880 ug/ft²	
0368026	SA W02	Furnace	Wipe	****	0.108	69.70 ug/ft²	370 ug/ft²	
0368027	SA W03	Furnace	Wipe	****	0.108	278.81 ug/ft²	490 ug/ft²	
0368028	SA W04	Furnace	Wipe	****	0.108	69.70 ug/ft²	180 ug/ft²	
0368029	SA W05	Furnace	Wipe	****	0.108	69.70 ug/ft²	320 ug/ft²	
0368030	SA Blank 2	Furnace	Wipe Blank	****	N/A	0.15 ug	< 0.15 ug	
0368031	SA W06	Furnace	Wipe	****	0.108	2.79 ug/ft²	13 ug/ft²	
0368032	SA W07	Furnace	Wipe	****	0.108	1.39 ug/ft²	1.9 ug/ft²	
0368033	SA W08	Furnace	Wipe	****	0.108	2.79 ug/ft²	14 ug/ft²	
0368034	SA W09	Furnace	Wipe	****	0.108	1.39 ug/ft²	1.6 ug/ft²	
0368035	SA W10	Furnace	Wipe	****	0.108	1.39 ug/ft²	4.4 ug/ft²	
0368036	SA Blank 3	Furnace	Wipe Blank	****	N/A	0.15 ug	< 0.15 ug	
0368037	SA W11	Furnace	Wipe	****	0.108	69.70 ug/ft²	250 ug/ft²	
0368038	SA W12	Furnace	Wipe	****	0.108	2.79 ug/ft²	12 ug/ft²	
0368039	SA W13	Furnace	Wipe	****	0.108	2.79 ug/ft²	11 ug/ft²	
0368040	SA W14	Furnace	Wipe	****	0.108	2.79 ug/ft²	3.1 ug/ft²	
0368041	SA W15	Furnace	Wipe	****	0.108	2.79 ug/ft²	< 2.8 ug/ft²	
0368042	SA Blank 4	Furnace	Wipe Blank	****	N/A	0.15 ug	< 0.15 ug	

AMA A[redacted]ical Services, Inc.
A Specialized Environmental Laboratory

BEST A[redacted]COPY

CERTIFICATE [redacted] ANALYSIS

[redacted]VLAP
NY ELAP
AIHA

Client:	US Army - CHPPM	**Job Name:**	MD ARNG Salisbury	**Chain Of Custody:**	117741
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	09/17/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[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 (ft^2)	Reporting Limit	Final Result	Comments

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

Analyst: [redacted]   [redacted]

AMA [redacted]lytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

[redacted]VLAP
NY ELAP
AIHA

Client:	US Army - CHPPM	**Job Name:**	MD ARNG Salisbury	**Chain Of Custody:**	117741
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	09/17/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[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 (ft^2)	Reporting Limit		Final Result			Comments
0368024	SA Blank 1	Furnace	Wipe Blank	****	N/A	0.15	ug	<	0.15	ug	
0368025	SA W01	Furnace	Wipe	****	0.108	139.41	ug/ft^2		880	ug/ft^2	
0368026	SA W02	Furnace	Wipe	****	0.108	69.70	ug/ft^2		370	ug/ft^2	
0368027	SA W03	Furnace	Wipe	****	0.108	278.81	ug/ft^2		490	ug/ft^2	
0368028	SA W04	Furnace	Wipe	****	0.108	69.70	ug/ft^2		180	ug/ft^2	
0368029	SA W05	Furnace	Wipe	****	0.108	69.70	ug/ft^2		320	ug/ft^2	
0368030	SA Blank 2	Furnace	Wipe Blank	****	N/A	0.15	ug	<	0.15	ug	
0368031	SA W06	Furnace	Wipe	****	0.108	2.79	ug/ft^2		13	ug/ft^2	
0368032	SA W07	Furnace	Wipe	****	0.108	1.39	ug/ft^2		1.9	ug/ft^2	
0368033	SA W08	Furnace	Wipe	****	0.108	2.79	ug/ft^2		14	ug/ft^2	
0368034	SA W09	Furnace	Wipe	****	0.108	1.39	ug/ft^2		1.6	ug/ft^2	
0368035	SA W10	Furnace	Wipe	****	0.108	1.39	ug/ft^2		4.4	ug/ft^2	
0368036	SA Blank 3	Furnace	Wipe Blank	****	N/A	0.15	ug	<	0.15	ug	
0368037	SA W11	Furnace	Wipe	****	0.108	69.70	ug/ft^2		250	ug/ft^2	
0368038	SA W12	Furnace	Wipe	****	0.108	2.79	ug/ft^2		12	ug/ft^2	
0368039	SA W13	Furnace	Wipe	****	0.108	2.79	ug/ft^2		11	ug/ft^2	
0368040	SA W14	Furnace	Wipe	****	0.108	2.79	ug/ft^2		3.1	ug/ft^2	
0368041	SA W15	Furnace	Wipe	****	0.108	2.79	ug/ft^2	<	2.8	ug/ft^2	
0368042	SA Blank 4	Furnace	Wipe Blank	****	N/A	0.15	ug	<	0.15	ug	

AM[redacted]lytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP
NY ELAP
AIHA

Client:	US Army - CHPPM	**Job Name:**	MD ARNG Salisbury	**Chain Of Custody:**	117741
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	09/17/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[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

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

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

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

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

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

Analyst: [redacted] **Technical Manager:** [redacted]

An AIHA (#8863), NVLAP (# 101143), & New York 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

BEST AVAILABLE COPY

CERTIFICATE OF ANALYSIS

NVLAP
NY ELAP
AIHA

Client:	US Army - CHPPM	**Job Name:**	Salisbury/Crisfield	**Chain Of Custody:**	117739
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	09/17/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	17-Sep-03

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0367996	40903RR07	Flame	Air	260	N/A	11.54	ug/m³	<	12	ug/m³	
0367997	40903RR08	Flame	Air	254	N/A	11.81	ug/m³	<	12	ug/m³	
0367998	40903RR09 B1	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	
0367999	40903RA10	Flame	Air	202	N/A	14.85	ug/m³	<	15	ug/m³	
0368000	40903RR11	Flame	Air	196	N/A	15.31	ug/m³	<	15	ug/m³	
0368001	40903RR12BL	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	

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

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

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

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

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

[redacted]

Analyst: [redacted] **Technical Manager:** [redacted]

An AIHA (#8863), NVLAP (# 101143), & New York ELAP (#10920) Accredited Laboratory
4475 Forbes Blvd. • Lanham, MD 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (301) 459-2643

BEST AVAILABLE COPY

APPENDIX E

REFERENCES

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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

APPENDIX F

LEAD CLEANING GUIDANCE

BEST AVAILABLE COPY

CHAPTER 14: CLEANING

BEST AVAILABLE COPY

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).

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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.

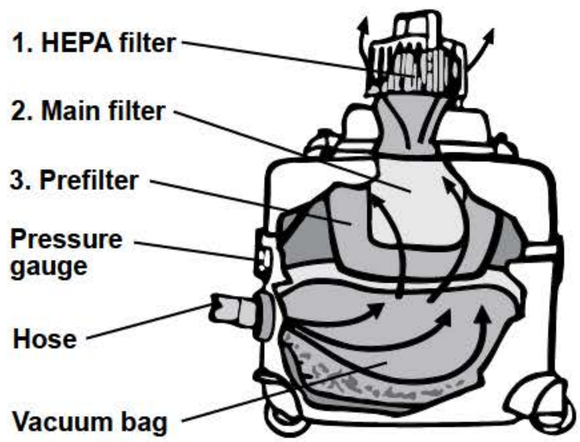
To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture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

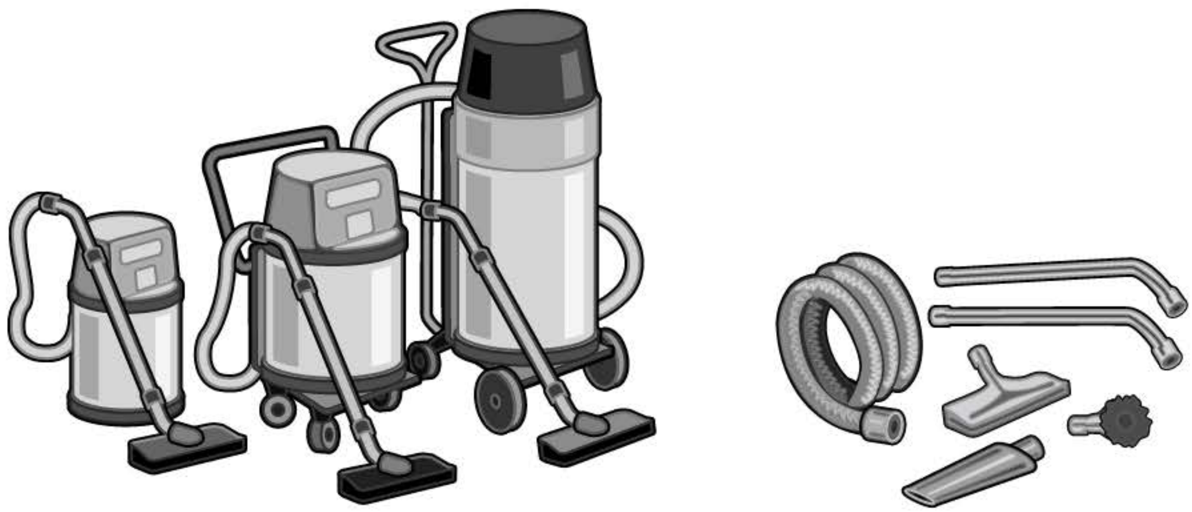
2. Wet Detergent Wash

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

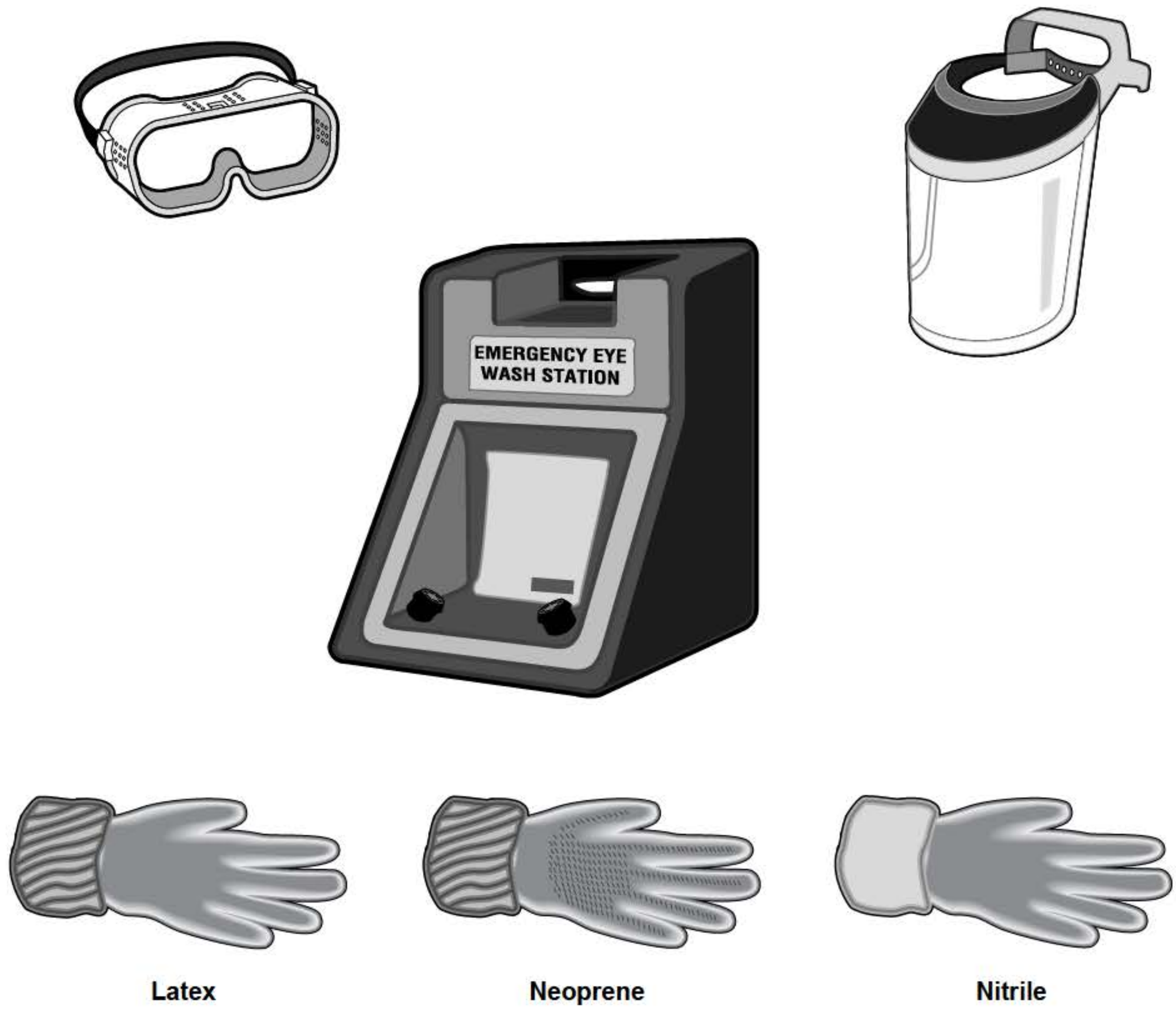
At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing 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

BEST AVAILABLE COPY

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

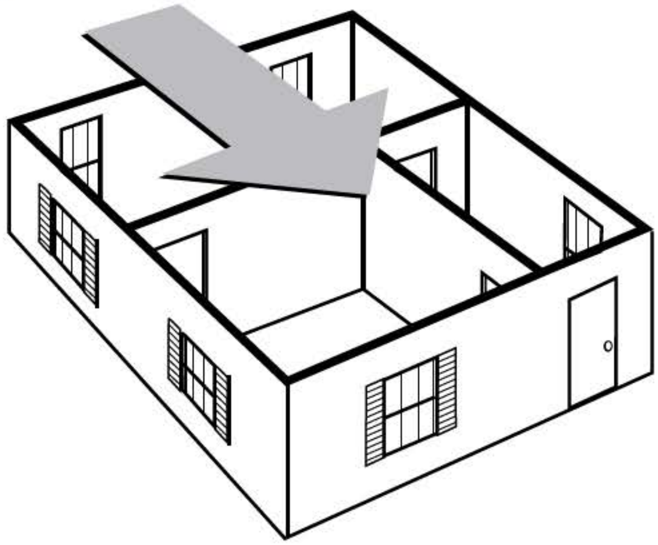
Typical Procedures

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:

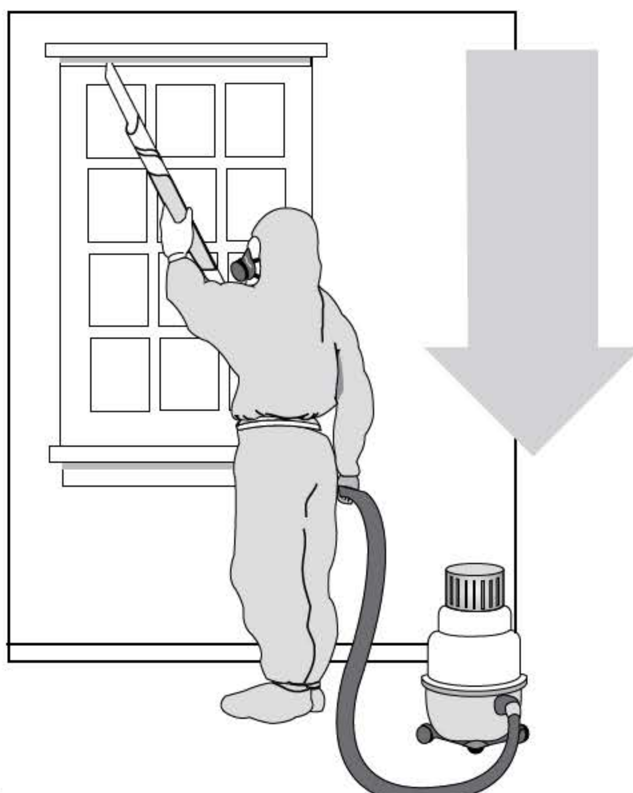
- First, the area is HEPA vacuumed.

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

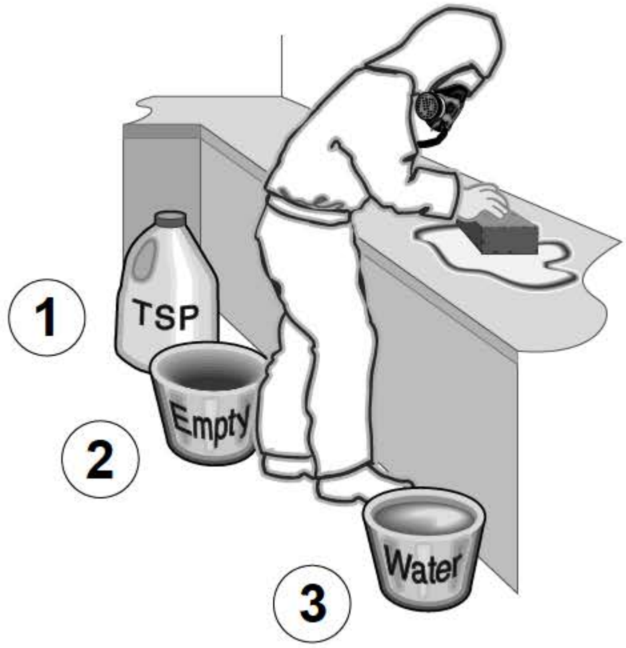
Powered Carpet Beater

Wheeled Floor Nozzle

BEST AVAILABLE COPY

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

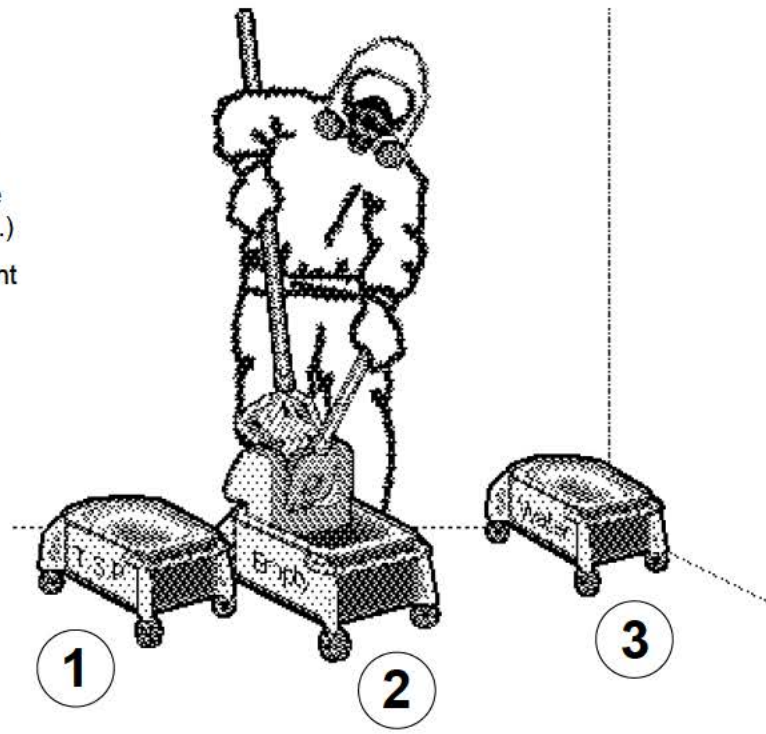
Don't Dry Sweep

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.

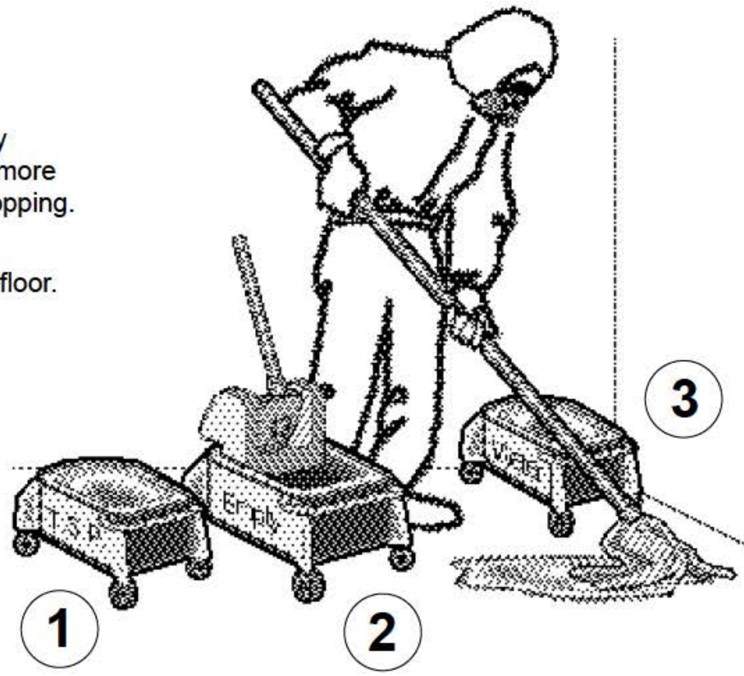
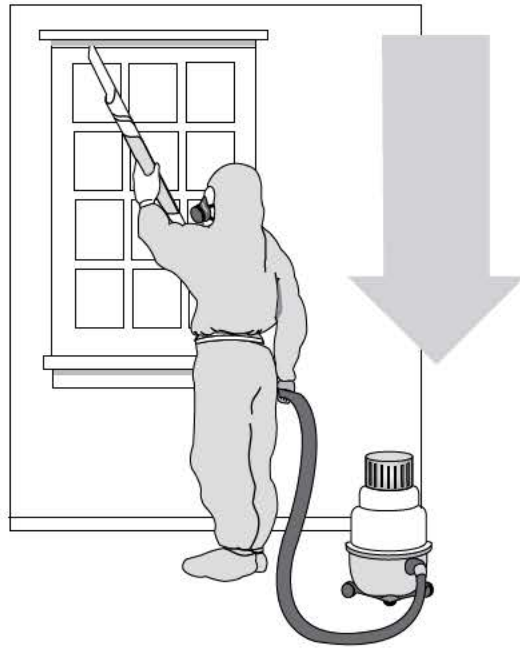


Figure 14.4d (continued)

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

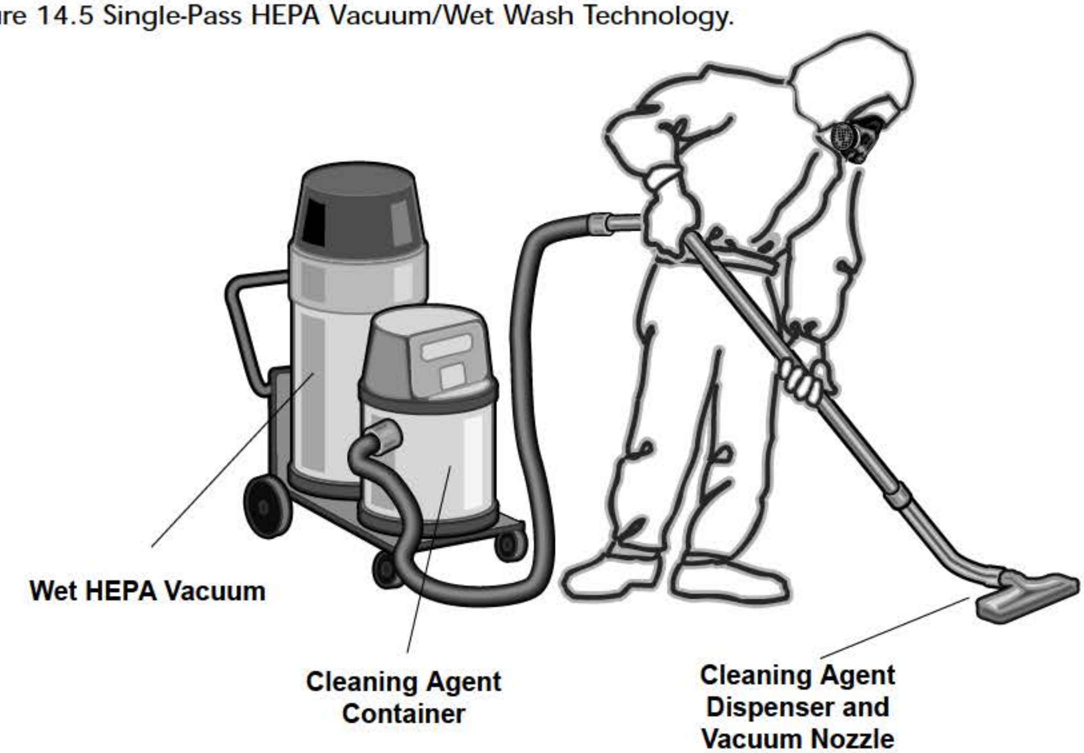
The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

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

BEST AVAILABLE COPY

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).

BEST AVAILABLE COPY

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

BEST AVAILABLE COPY

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

BEST AVAILABLE COPY

Army Facilities Management Information Document on Mold Remediation Issues

TG 277
FEBRUARY 2002

USACHPPM
Readiness thru Health

BEST AVAILABLE COPY

ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

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.

BEST AVAILABLE COPY

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)

BEST AVAILABLE COPY

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.

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.

BEST AVAILABLE COPY

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)

BEST AVAILABLE COPY

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

Disposable Protective Clothing

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

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

APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

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.

BEST AVAILABLE COPY

Local Reproduction is Authorized and Encouraged.

USACHPPM
Readiness thru Health

BEST AVAILABLE COPY

Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278
February 2002

USACHPPM
Readiness thru Health

Table of Contents

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.

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.

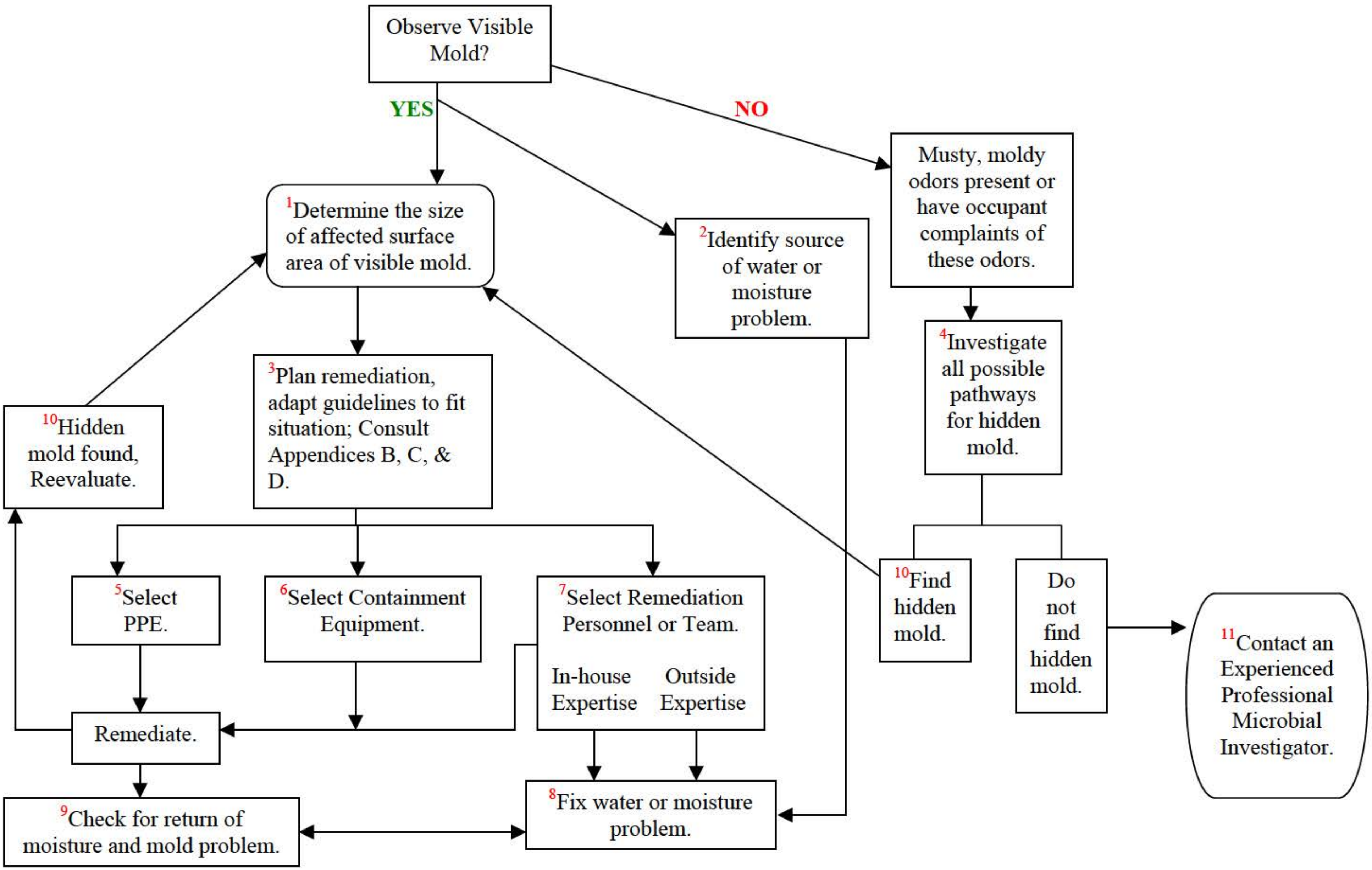
7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

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.

Local Reproduction is Authorized and Encouraged.

USACHPPM
Readiness thru Health

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

Industrial Hygiene Survey

National Guard Facility
Salisbury Armory

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Salisbury Armory** **28722 Ocean Gateway** **Salisbury, MD 21801**
Prepared By:	**Analytical Laboratory Services, Inc.** **3544 North Progress Avenue** **Suite 100** **Harrisburg, PA 17110**
Survey Date:	**October 28, 2010**
Report Date:	**December 7, 2010**
ALSI Project #:	**1010714**

[redacted]

[redacted] **CIH**
Director, Environmental Health & Safety

3544 North Progress Avenue ✦ Suite 100 ✦ Harrisburg, PA 17110
TEL: 717-540-3424 ✦ FAX: 717-540-3428

Table of Contents

BEST AVAILABLE COPY

Section 1.0
Executive Summary

BEST AVAILABLE COPY

Section 1.0 Executive Summary

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

1. Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft^2 in the basement on the heat vent. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2. Peeling and damaged paint should be repaired and properly remediated.

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

   a. Kitchen
   b. Garage
   c. Basement – Commo Room
   d. Basement – NBC Room

   Lighting should be improved in these areas.

3. Indoor air quality parameters of temperature, relative humidity carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment. Relative humidity was higher than the recommended criteria of 30-60% in indoor locations. There is no central air-conditioning system in this facility. Doors and windows were open.

4. Water damaged ceilings and active roof leaks should be repaired. The most notable roof leak was in the front lobby. Water damaged ceiling tile should be removed and replaced.

5. The overhead vehicle exhaust ventilation system in the garage does not meet the minimum requirements. This system should be inspected to determine if it is operating as designed and meets the minimum requirements as recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation: A Manual of Recommended Practice for Design (27th Edition).

BEST AVAILABLE COPY

Section 2.0
Operation Description & Observations

BEST AVAILABLE COPY

Section 2.0 Operation Description & Observations

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

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

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

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

There is no child-care facility in the building.

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

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

BEST AVAILABLE COPY

Section 3.0
Noise Survey

BEST AVAILABLE COPY

Section 3.0 Noise Survey

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

BEST AVAILABLE COPY

Section 4.0
Lead Testing

BEST AVAILABLE COPY

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. Bulk samples were collected of peeling paint. Air samples were collected using 0.8 um mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2	Paint Chip %Pb
1	Conference Room	<8.2		
2	RHC Common Room	<8.3		
3	Blank	<3 (ug)		
4	Lobby -- Ceiling			0.011
5	Old Firing Range - Center of Floor		<110	
6	Old Firing Range -- Heat Exchanger		<110	
7	Old Firing Range -- Exit Light		<110	
8	Entrance of Firing Range – Floor		<110	
9	NBC Room -- Tabletop		<110	
10	Lobby Floor		<110	
11	Kitchen - Countertop		<110	
12	Drill Hall -- Floor		<110	
13	Basement -- Heat Vent		**2,000**	
14	RHC Common Room Table		<110	
15	Blank		<12 (ug)	
Criteria		**50**	**200**	**0.5**

Key: **Bolded** results exceed listed criteria

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

Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft^2 on the basement heat vent. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2. Peeling and damaged paint should be repaired and properly remediated.

The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for Environmental Chemicals," the US Army Center for Health Promotion and Preventive

Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

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

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

BEST AVAILABLE COPY

Section 5.0
Lighting

BEST AVAILABLE COPY

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
Conference Room	85.8	30-50	Yes
Second Floor Office	91.1	30-50	Yes
Copy Room/Office	75.6	30-50	Yes
Drill Hall	50 – 100	30-50	Yes
Kitchen	21.5	30-50	No
Locker Room	52.3	7	Yes
Storage Room	52.7	30	Yes
S-4 Office	83.1	30-50	Yes
Garage	65	75	No
Orderly Room/Office	38.3	30-50	Yes
Old Firing Range (Storage)	72.5	30	Yes
Basement – Commo Room (Storage)	11.3	30	No
Basement – NBC Room (Storage)	9.0	30	No

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

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

Lighting should be improved in these areas.

BEST AVAILABLE COPY

Section 6.0
Indoor Air Quality

BEST AVAILABLE COPY

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 8554 (Serial #02041013). The IAQ Meter was last calibrated in Sept 2010.

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

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 70.3 to 73.4 degrees F with relative humidity readings ranging from 64.9% to 89.1%. During the survey, carbon dioxide (CO_2) levels ranged from 313 ppm to 528 ppm within the facility compared to an outdoor CO_2 level of 321 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,021 ppm (321 ppm + 700 ppm). Carbon monoxide (CO) was 0 ppm in all locations tested.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	72.5	88.2	347	0.0
Conference Room	70.3	**71.6**	465	0.0
Second Floor Office	72.5	**87.0**	459	0.0
Copy Room/Office	73.0	**81.0**	431	0.0
Drill Hall	72.3	**89.1**	396	0.0
Kitchen	72.5	**88.8**	413	0.0
Locker Room	72.3	**86.1**	362	0.0
Storage Room	71.6	**83.3**	390	0.0
S-4 Office	72.3	**64.9**	406	0.0
Garage	73.4	**87.7**	368	0.0
Orderly Room/Office	73.2	**78.6**	528	0.0
Old Firing Range (Storage)	72.0	**82.5**	313	0.0
Basement Commo Room	72.0	**81.5**	323	0.0
Basement NBC Room	71.4	**82.2**	326	0.0
Outdoors	72.1	86.0	294	0.0
Criteria	**68.0-79.0**	**30-60**	**<1,021**	**<9.0**

Key: **Bolded** results exceed listed criteria

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

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

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

A visual inspection was conducted throughout visually accessible portions of the facility. The visual inspection was conducted to assess sources or pathways of factors potentially deleterious to IAQ. Water damaged ceilings and active roof leaks are present in a few areas. The most notable area was the front lobby where a water leak from the second floor shower was present. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

Section 7.0
Suspect Asbestos Containing Building Materials

BEST AVAILABLE COPY

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, brown, green and tan floor tile and mastic are present in the facility. Approximately 10,000 ft^2 was observed. Floor tile appeared to be in good condition.

2. 1' x 1' ceiling tile were observed throughout the facility. This appeared to be in good condition throughout the facility except a small area of the lobby where a water leak was present. This water leak should be repaired.

Section 8.0
Maintenance Bay

BEST AVAILABLE COPY

Section 8.0 Maintenance Bay

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

1. Bay 2 169 CFM
2. Bay 4 – 133 CFM

The actual flow rate that is required in an overhead vehicle exhaust system varies depending on the engine tail pipe temperature, whether or not the vehicle is "under load" or idling, engine displacement, engine size, etc. As an example, a 15 Liter Engine running at 1,000 rpm with an exhaust gas temperature of 1,300 F (heavy load) would require an exhaust flow of 2,110 CFM. We recommend the overhead vehicle exhaust system be inspected to determine if it is operating as designed and meets the minimum requirements as recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation: A Manual of Recommended Practice for Design (27^{th} Edition).

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

BEST AVAILABLE COPY

Section 9.0
Limitations

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

Appendix A
Laboratory Analysis Report

BEST AVAILABLE COPY

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:	Salisbury Armory	Chain Of Custody:	509114
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Salisbury Armory	Date Submitted:	11/1/2010
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	[redacted]
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	11/8/2010 Report Date: 11/8/2010
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
1110305	1010714-1	Flame	Air	364	N/A	8.2 ug/m³	<3	<8.2 ug/m³	
1110306	1010714-2	Flame	Air	362	N/A	8.3 ug/m³	<3	<8.3 ug/m³	
1110307	1010714-3	Flame	Air Blank	0	N/A	3 ug/m³		<3 ug	
1110308	1010714-4	Flame	Paint Chip	****	N/A	0.0077 %Pb		0.011 %Pb	
1110309	1010714-5	Flame	Wipe	****	0.108	110 ug/ft²	<12	<110 ug/ft²	
1110310	1010714-6	Flame	Wipe	****	0.108	110 ug/ft²	<12	<110 ug/ft²	
1110311	1010714-7	Flame	Wipe	****	0.108	110 ug/ft²	<12	<110 ug/ft²	
1110312	1010714-8	Flame	Wipe	****	0.108	110 ug/ft²	<12	<110 ug/ft²	
1110313	1010714-9	Flame	Wipe	****	0.108	110 ug/ft²	<12	<110 ug/ft²	
1110314	1010714-10	Flame	Wipe	****	0.108	110 ug/ft²	<12	<110 ug/ft²	
1110315	1010714-11	Flame	Wipe	****	0.108	110 ug/ft²	<12	<110 ug/ft²	
1110316	1010714-12	Flame	Wipe	****	0.108	110 ug/ft²	<12	<110 ug/ft²	
1110317	1010714-13	Flame	Wipe	****	0.108	110 ug/ft²	210	2000 ug/ft²	
1110318	1010714-14	Flame	Wipe	****	0.108	110 ug/ft²	<12	<110 ug/ft²	
1110319	1010714-15	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

LAB #100470

NY ELAP 10920

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

Job Name: Salisbury Armory
Job Location: Salisbury Armory
Job Number: Not Provided
P.O. Number: W912K6-09-A-0003

Chain Of Custody: 509114
Date Submitted: 11/1/2010
Person Submitting: [redacted]
Date Analyzed: 11/8/2010
Report Date: 11/8/2010

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.

[redacted]

Analyst: [redacted]

[redacted]

Technical Manager: [redacted]

Page 1 of 2

OVII (410) 2-17-2024 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)

509114

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: Salisbury Armory
2. Job Location: Salisbury, MD
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Pers[redacted] @ phone # (410) 942-0273
5. Submitted by[redacted]ature[redacted]

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

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

NORMAL BUSINESS HOURS:
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day+
☐ 2 Day Date Due: 11/8/10
☐ Results Required By Noon (Every Attempt Will Be Made to Accommodate)

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ Email[redacted] @analyticallab.com
☐ Fax[redacted]1@us.army.mil
☐ Verb[redacted]e@us.army.mil

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

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ 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) 11 (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
1010714-1	Conference Rm	10/28	304					X		X						
1010714-2	HHC Comm Rm		302					X		X						
1010714-3	Blank		0					X		X						
1010714-4	Lobby - Paint							X			X					
1010714-5	Old Firing Range Center of Floor			100cm²				X				X				
1010714-6	Old Firing Range Heat Exchanger							X				X				
1010714-7	Old Firing Range [illegible]							X				X				
1010714-8	Entrance to Firing Range - Floor							X				X				
1010714-9	NBC Rm - Tabletop							X				X				
1010714-10	Lobby - Floor							X				X				
1010714-11	Kitchen-Countertop							X				X				
1010714-12	Drill Hall Floor							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: 11 / 1 / 10 @ 900 Via: UPS By (Print) Nicole Meadows Sign:
2. Date/Time Analyzed: / / @ By (Print) Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

BEST AVAILABLE COPY

Page 2 of 2

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)   509114 (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-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: Salisbury Armory
2. Job Location: Salisbury, MD
3. Job #: [redacted] WO #: 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)
☐ 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: [redacted]@analyticallab.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 __ (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)
☐ Quant. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quant. (s/area) Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)
☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

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

CLIENT ID NUMBER	SAMPLE INFORMATION SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1010714-13	Basement Heat Vent	10/08		100cm²				X				X				
1010714-14	HHC Conference Table	↓		↓				X				X				
1010714-15	Blank	↓		0cm²				X				X				

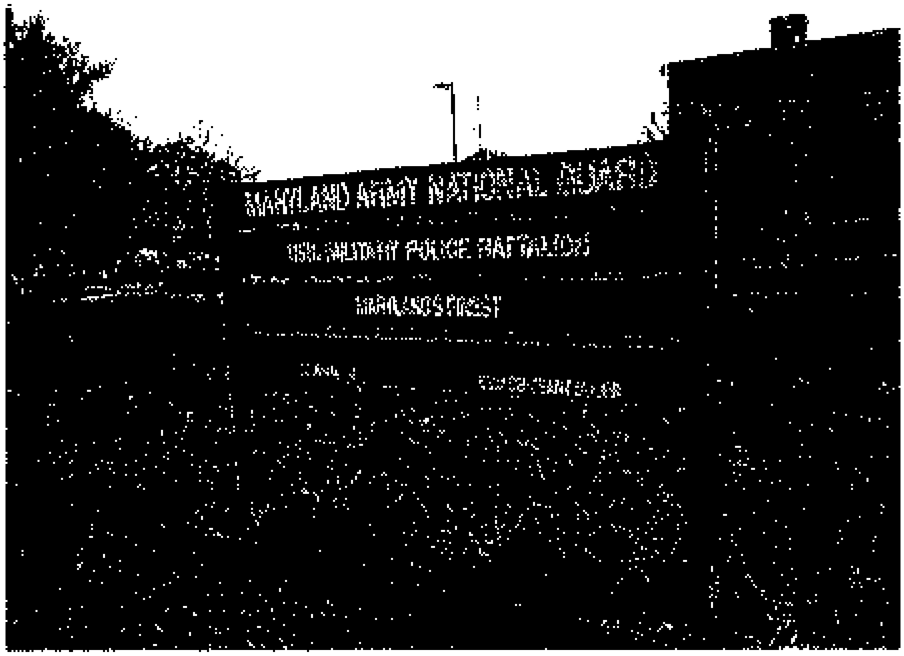
CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: ____ Contact: ____ By: ____
Date/Time: ____ Contact: ____ By: ____
Date/Time: ____ Contact: ____ By: ____

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

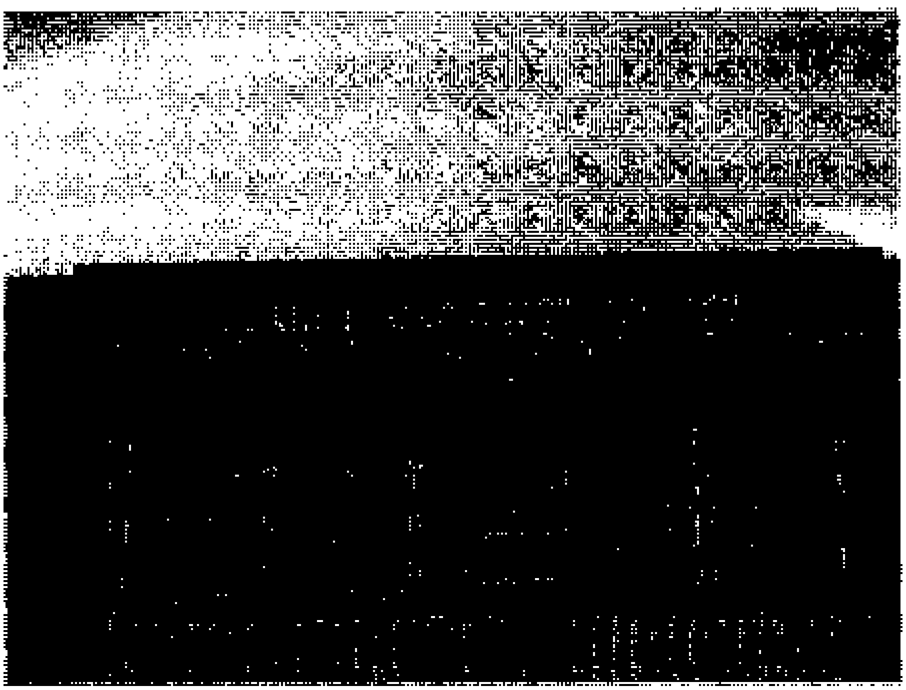
BEST AVAILABLE COPY

Appendix B
Photographs

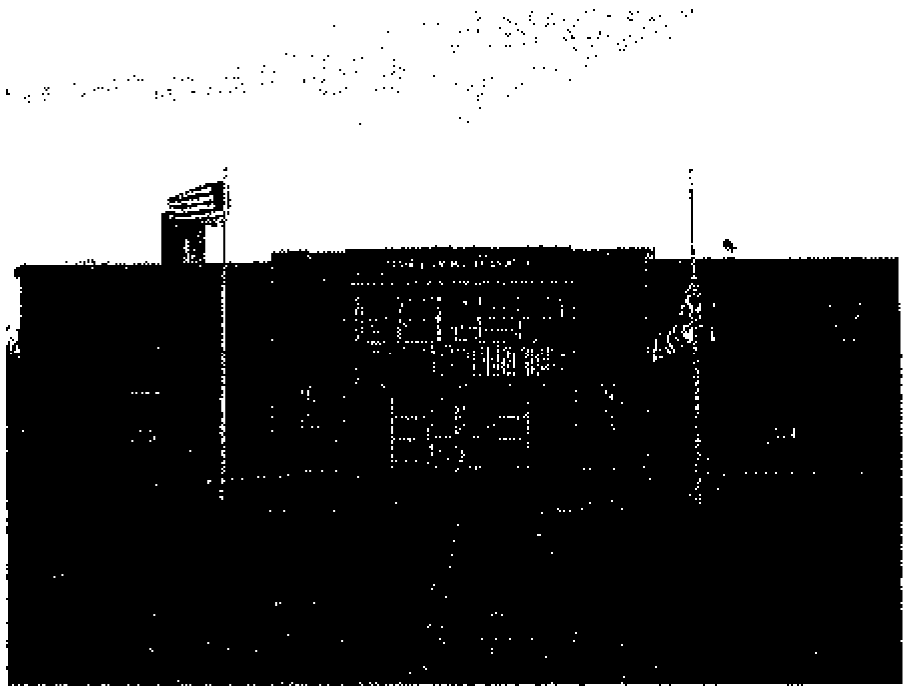
BEST AVAILABLE COPY



Exterior



Exterior

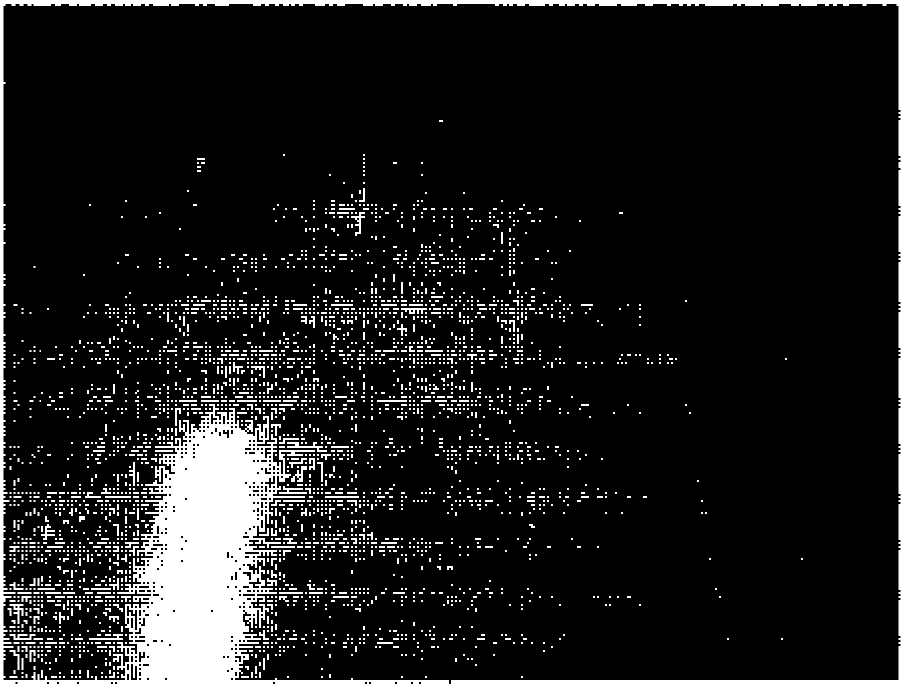


Exterior

Drill Hall

Garage

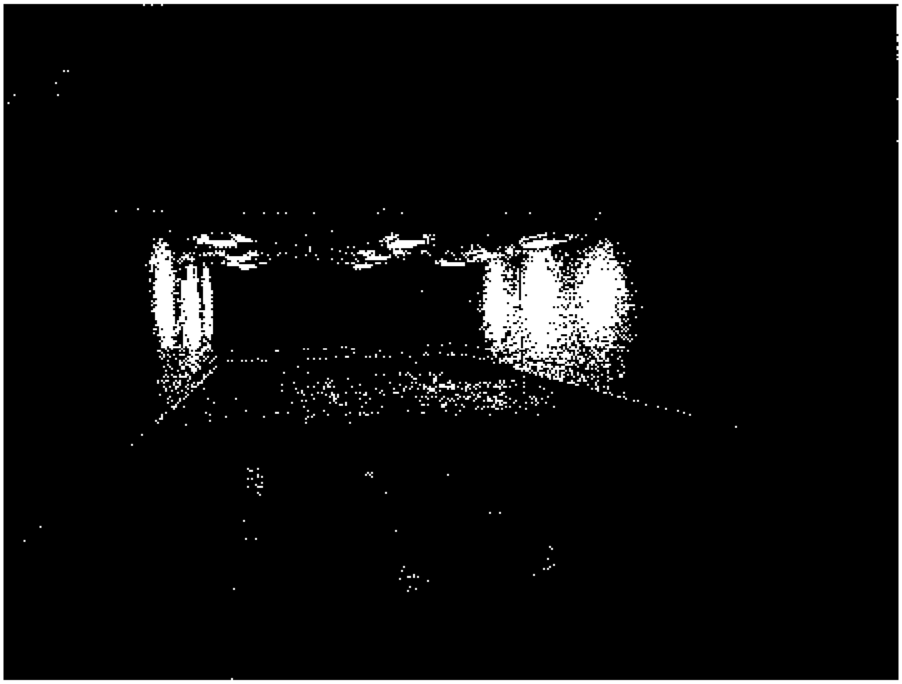
Garage LEV



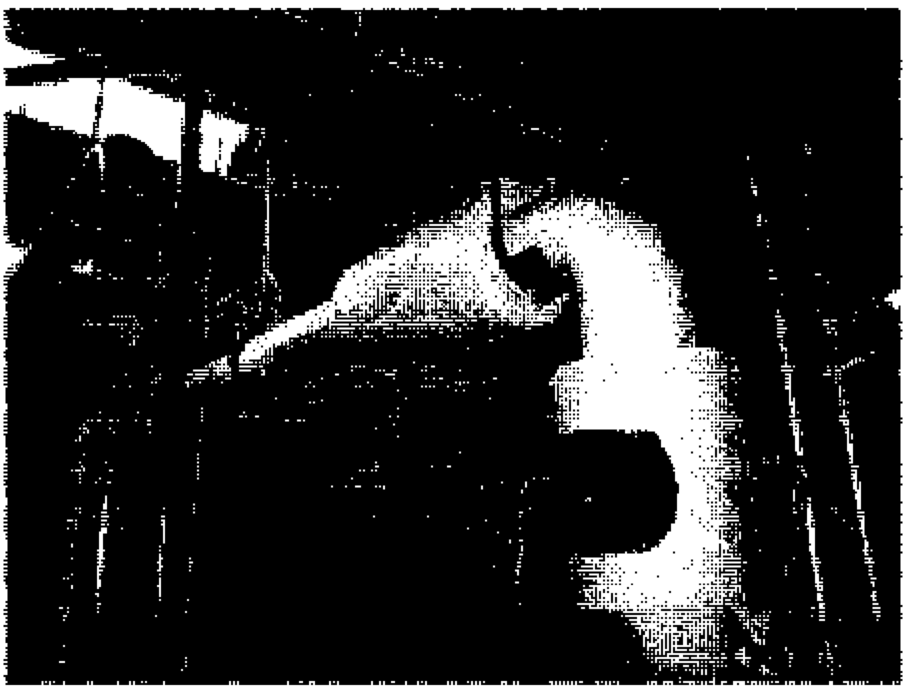
Typical Vinyl Floor Tile (VFT)

Water Damaged Ceiling in Lobby

BEST AVAILABLE COPY



Old Firing Range

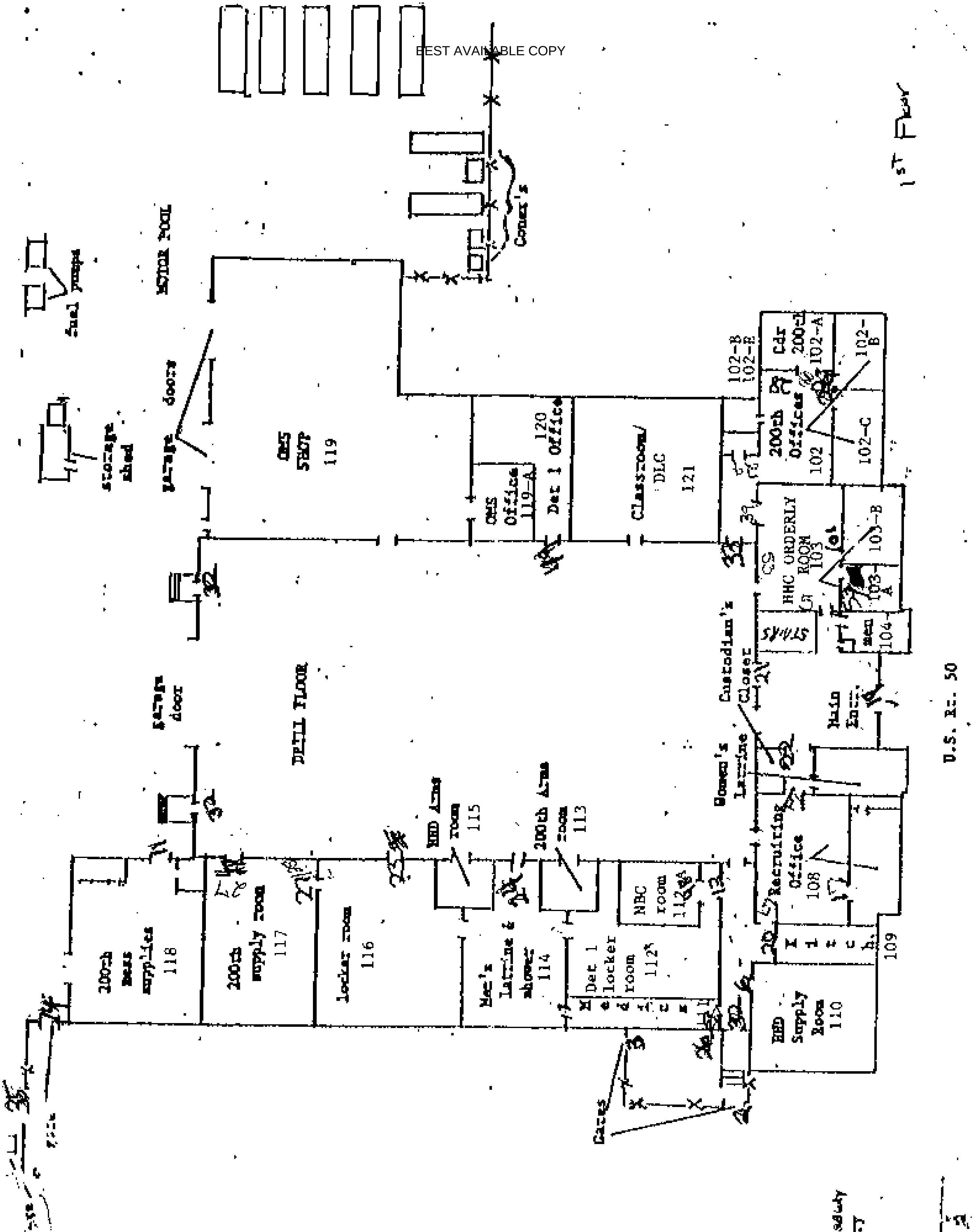


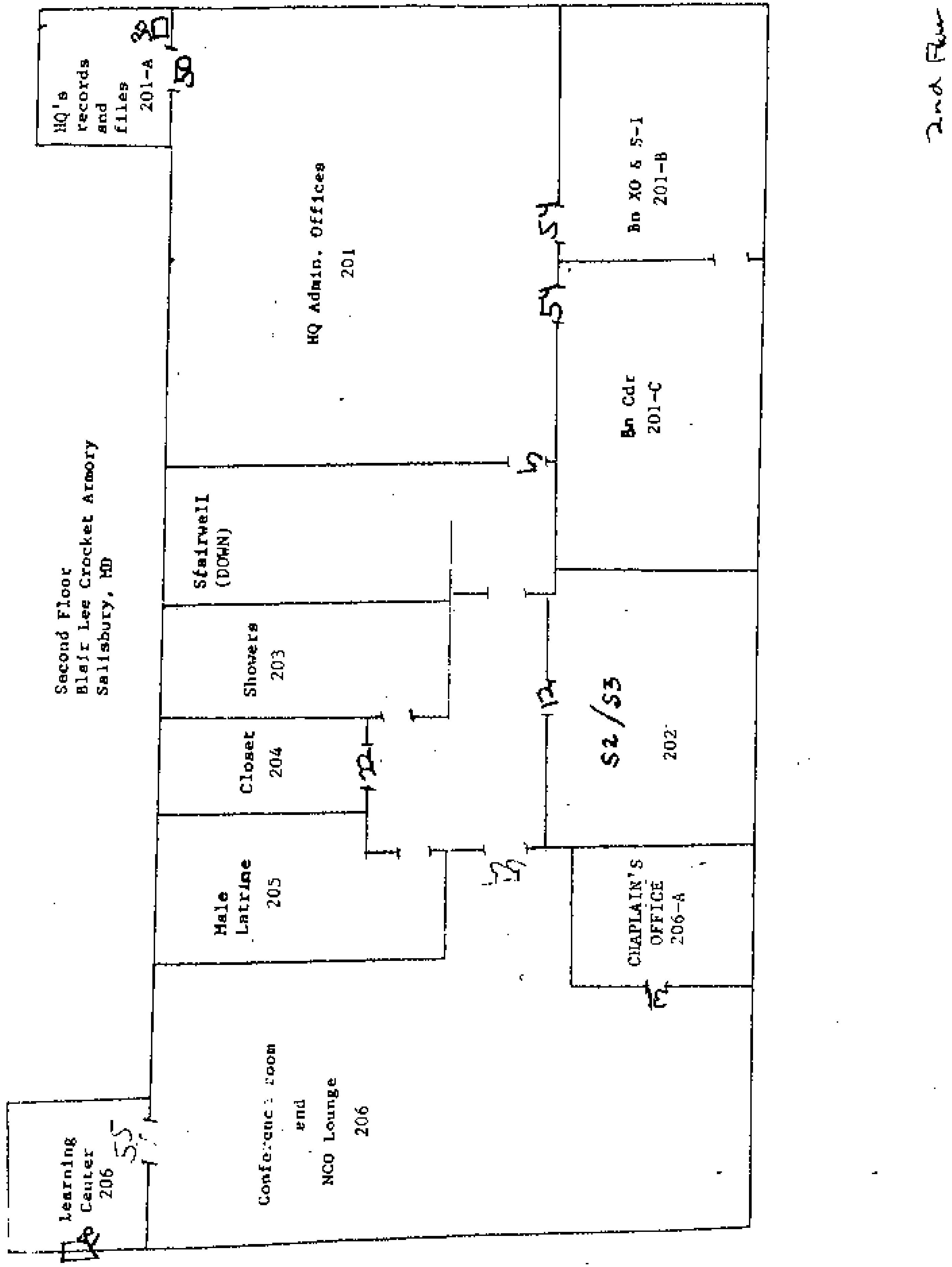
Boiler Room

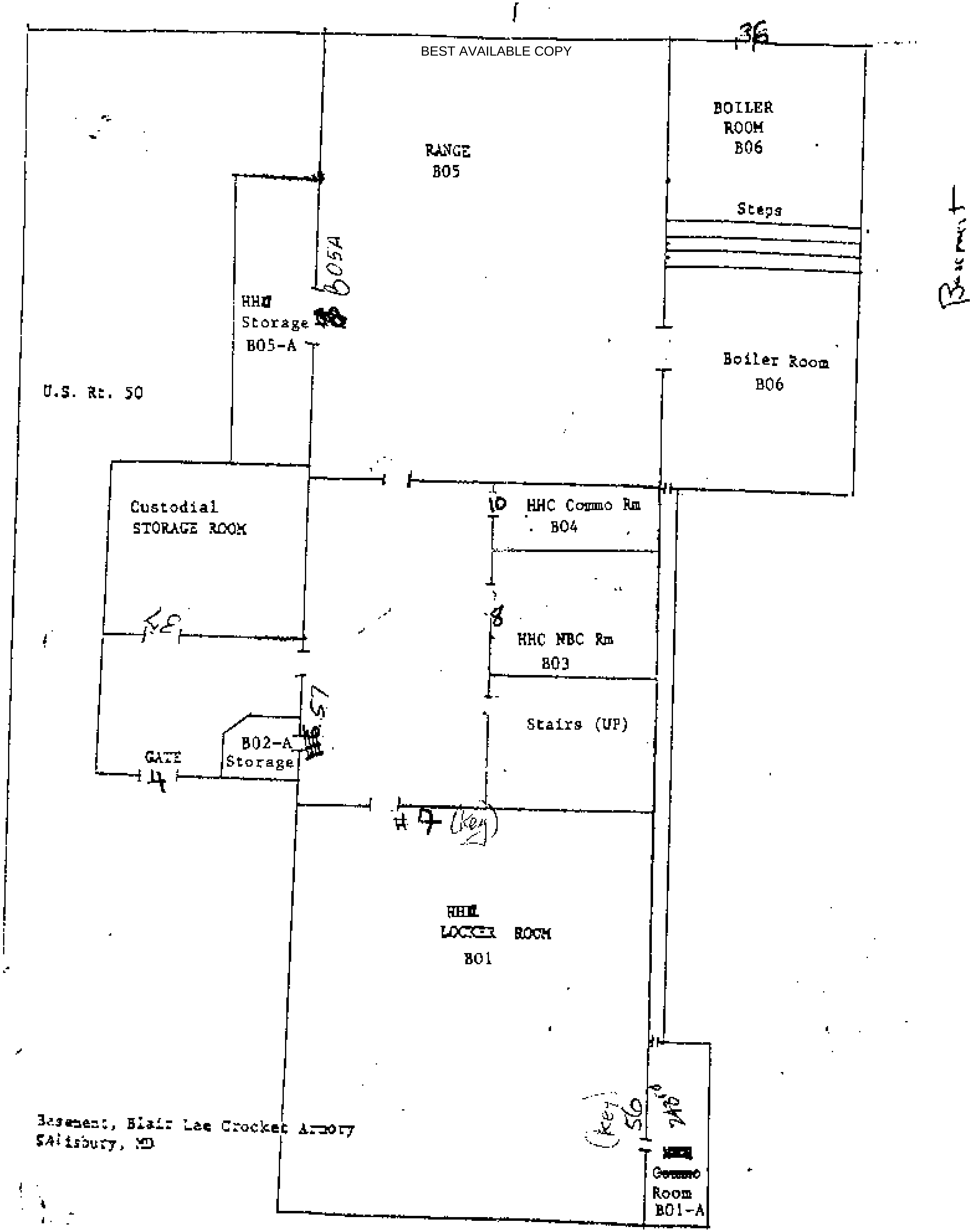
BEST AVAILABLE COPY

Appendix C
Floor Plan

BEST AVAILABLE COPY


1st Floor
MOTOR POOL
fuel pumps
storage shed
garage doors
OMS SHOP
119
Conex's
OMS Office 119-A
120 Det 1 Office
Classroom/ DLC
121
102-B
102-E
Cdr 200-E
102-A
102-B
200th Offices
102
102-C
HHC ORDERLY ROOM
103
103-B
103-A
CS
Men
104
STAIRS
Custodian's Closet
Main Entr.
U.S. Rt. 50
DRILL FLOOR
garage door
Women's Latrine
Recruiting Office
108
HHD Arms room
115
200th Arms room
113
NBC room
112-A
Kitchen
109
200th Bess supplies
118
200th supply room
117
locker room
116
Men's latrine & shower
114
Det 1 locker room
112
Mech room
HHD Supply Room
110
Gates
storage shed


Second Floor
Blair Lee Crocket Armory
Salisbury, MD
HQ's records and files
201-A
HQ Admin. Offices
201
Bn XO & S-1
201-B
Bn Cdr
201-C
Stairwell
(DOWN)
Showers
203
Closet
204
Male Latrine
205
S2/S3
202
CHAPLAIN'S OFFICE
206-A
Conference room
and
NCO Lounge
206
Learning Center
206
2nd Flr



Basement, Blair Lee Crocket Armory
SAlisbury, MD

Appendix D
References

BEST AVAILABLE COPY

Appendix D. References

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

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

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

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

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

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

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

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

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

BEST AVAILABLE COPY

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
Salisbury City Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Salisbury Readiness Center** **28722 Ocean Gateway** **Salisbury, MD 21801**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**June 18, 2013**
Report Date:	**July 12, 2013**

Non-Responsive [redacted]

Non-Responsive [redacted]
Manager, Industrial Hygiene Services

Table of Contents

Section 1.0 Executive Summary

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

1. Lead surface and air samples were collected. All results were less than recommended guidelines. See Section 3.0 for detailed sampling results.

2. Lighting levels did not meet the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in Mechanical Room 002. See Section 4.0 for detailed findings.

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

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

    b. The relative humidity levels measured indoors exceeded the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60%.

    c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 parts per million (ppm).

    d. Carbon dioxide ($CO_{2)}$ levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings.

    See Section 5.0 for detailed sampling results.

4. Drill Hall doors were propped open during the survey. See Section 5.0 for detailed findings.

5. No suspect asbestos containing materials (ACM) were observed. See Section 6.0 for detailed sampling results.

BEST AVAILABLE COPY

Section 2.0 Operation Description & Observations

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

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

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

There is no child-care facility in the building.

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

This facility has a converted firing range (CFR) that is now used as a distance learning center.

No suspect asbestos containing material (ACM) was observed.

No chipped or peeling paint were observed.

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

Housekeeping is very good.

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

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

BEST AVAILABLE COPY

Section 3.0 Lead Testing

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

Lead Testing Results Summary

Sample #	**Location**	**Air ug/m^3**	**Surface ug/ft^2**
1	Drill Hall	<6.2	*
2	Recruiting Office	<6.1	*
3	Blank	<3 ug	*
4	Blank	*	<12 ug
5	Drill Hall Floor Center	*	<110
6	Drill Hall Microwave Top	*	<110
7	Kitchen Ice Maker Top	*	<110
8	Supply Room Cabinet Top	*	<110
9	Gym Window Sill	*	<110
10	Break Room Vending Top	*	<110
11	CFR Floor	*	<110
12	CFR Outside Entrance Floor	*	<110
13	CFR Cabinet Top	*	<110
14	Admin Office Bookshelf Top	*	<110
15	2nd Floor Corridor Floor	*	<110
16	Room 205F Safe Top	*	<110
17	Room 206 File Cabinet Top	*	<110
18	Classroom 202 Window Sill	*	<110
19	Recruiting Office shelf Top	*	<110
-	**Criteria**	**50**	**200**

Table Notes:
1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2** = micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

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

BEST AVAILABLE COPY

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 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).

BEST AVAILABLE COPY

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

Table Notes:

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

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

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

BEST AVAILABLE COPY

Section 5.0 Indoor Air Quality

Survey measurements were made for comfort parameters and ventilation (temperature, relative humidity, carbon dioxide, and carbon monoxide). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7575-X (Serial #1228008). The IAQ Meter was last calibrated in July 2012.

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

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	76.9	91.3	372	0.0
Office 204	73.1	**74.4**	451	0.0
Office 119	73.7	**70.1**	715	0.0
Criteria	**68-79**	**30-60**	**<1,072**	**<9**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **°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 guideline of 30 – 60 % in all indoor areas sampled. Relative humidity should remain within the recommended guideline of 30% to 60%. It should be noted that Drill Hall doors were propped open during the site survey allowing warm, moist air to infiltrate the facility. This is likely the reason for the elevated relative humidity measurements.

BEST AVAILABLE COPY

- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,072 ppm (700 ppm + 372 ppm). This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide

- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. The only significant observation noted was that during rainstorms water reportedly flows down the outside stairwell into the basement. This area has a damp, musty odor.

BEST AVAILABLE COPY

Section 6.0 Suspect Asbestos Containing Building Materials (ACM)

No suspect (ACM) (asbestos containing material) was noted at the time of this survey:

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

Section 7.0 Equipment

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

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98002EL	4/2013	NA
SKC Air Sampling Pump	647631	6/17/13	2.49 LPM
SKC Air Sampling Pump	767926	6/17/13	2.50 LPM

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

Appendix A. Laboratory Analysis Report

BEST AVAILABLE COPY

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

BEST AVAILABLE COPY

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:**	516190
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Salisbury	**Date Submitted:**	6/25/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	Non-Responsive [redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	7/1/2013 **Report Date:** 7/1/2013

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 (ft^2)	Reporting Limit		Total ug	Final Result		Comments
13073141	1	Flame	Air	486	N/A	6.2	ug/m³	<3	<6.2	ug/m³	
13073142	2	Flame	Air	488	N/A	6.1	ug/m³	<3	<6.1	ug/m³	
13073143	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13073144	4	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13073145	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073146	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073147	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073148	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073149	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073150	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073151	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073152	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073153	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073154	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073155	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073156	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073157	17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073158	18	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073159	19	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	

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:**	516190
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Salisbury	**Date Submitted:**	6/25/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	7/1/2013 **Report Date:** 7/1/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

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

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

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

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

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

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

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

Air and Wipe results are not corrected for any blank results

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

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

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

Analyst [redacted]

Technical Manager: [redacted]

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) 516190

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-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: SAlisbury
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Perso[redacted] @ phone #: (410) 942-0273
5. Submitted by:[redacted] nature[redacted]

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

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

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☑ 5 Day + Date Due: 7/2/13
☐ 2 Day
☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

REPORT TO:
☒ Inclu[redacted] with Report
☒ Email[redacted] @compliance place.com
☐ Fax: @us.army.mil
☐ Verba @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) 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)

LOT 3/23/12
EXP 9/15

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1	DRILL HALL	6/18/13	486							✓						
2	RECRUITING OFFICE		488							✓						
3	BlAnK		–							✓						
4	BLANK			100cm²								✓				
5	DRILL HALL FLOOR CENTER											✓				
6	DRILL HALL MICROWAVE											✓				
7	KITCHEN ICE MAKER TOP											✓				
8	Supply-CABINET TOP											✓				
9	GYM WINDOW SILL											✓				
10	BREAK RM Vending TOP											✓				
11	CFR FLOOR											✓				
12	CFR OUTSIDE ENTRANCE 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: 6/25/13 @ 910 Via: Fedex By (Print): NMM Sign:
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): Sign:
3. Results Reported To: Via: Date: ___/___/___ Time: Initials:
4. Comments:

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

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) 516190
p. 2 of 2

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

Submittal Information:
1. Job Name: ARNG 4aMD
2. Job Location: SALISBURY
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Perso[redacted]
5. Submitted by:[redacted] ...ature [redacted]

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

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

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

REPORT TO: ☒ Inclu[redacted] ...with Report ☒ Ema[redacted] complianceplace.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 Cettost) 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
13	CFR CABINET TOP	6/18/13		100cm²								✓				
14	Admin office Bookshelf top	|		|								✓				
15	2nd Floor corridor Floor	|		|							✓				
16	Room 205F SAFE TOP	|		|							✓				
17	Room 206 File CAB TOP	|		|							✓				
18	CLASSROOM 202 window Sill	|		|							✓				
19	Recruiting office shelf top	|		|							✓				

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

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

Appendix B. Photographs

BEST AVAILABLE COPY

Salisbury RC

Drill Hall

Boiler Room

Outside Stairwell

BEST AVAILABLE COPY

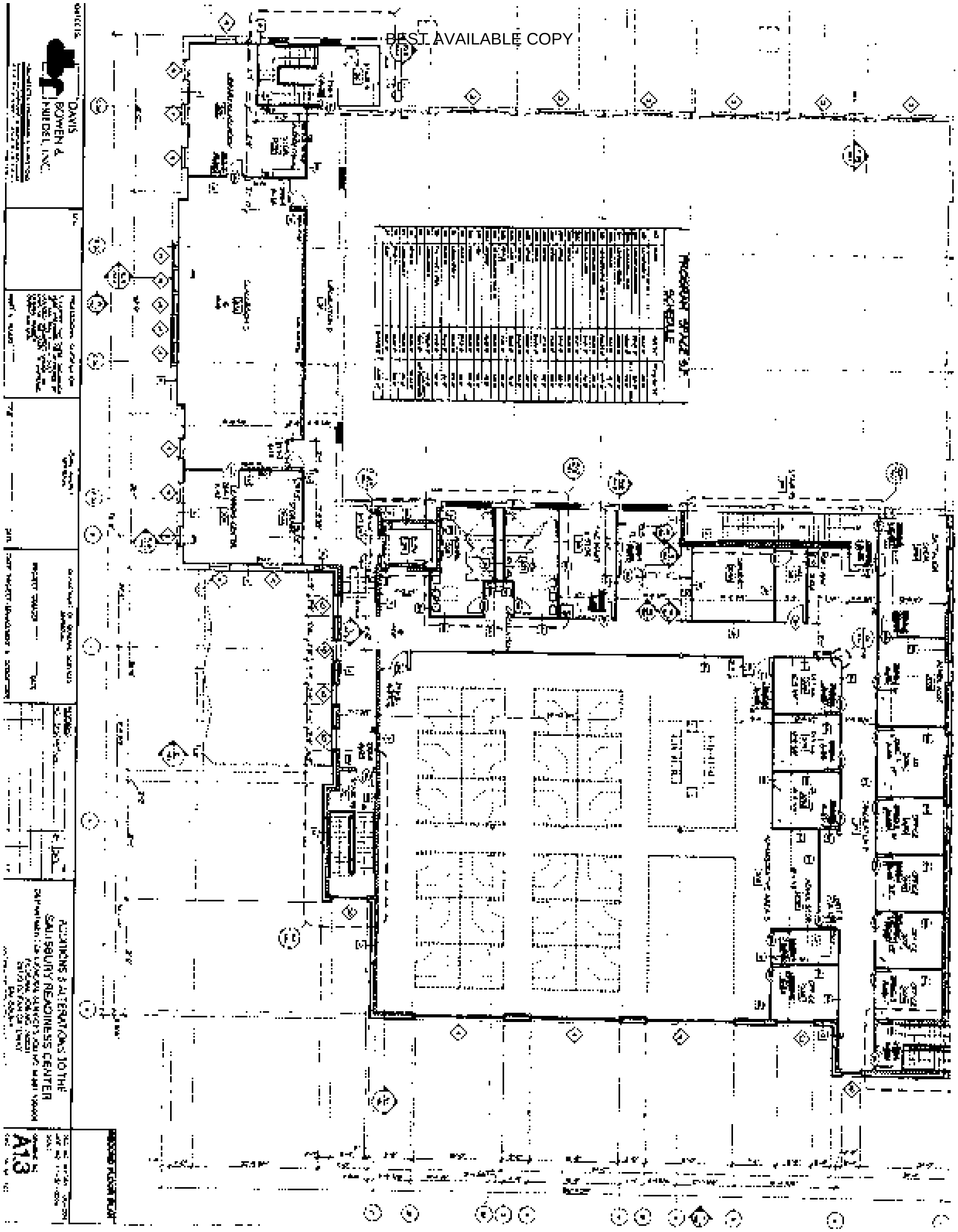
Standing Water in the Outside Stairwell

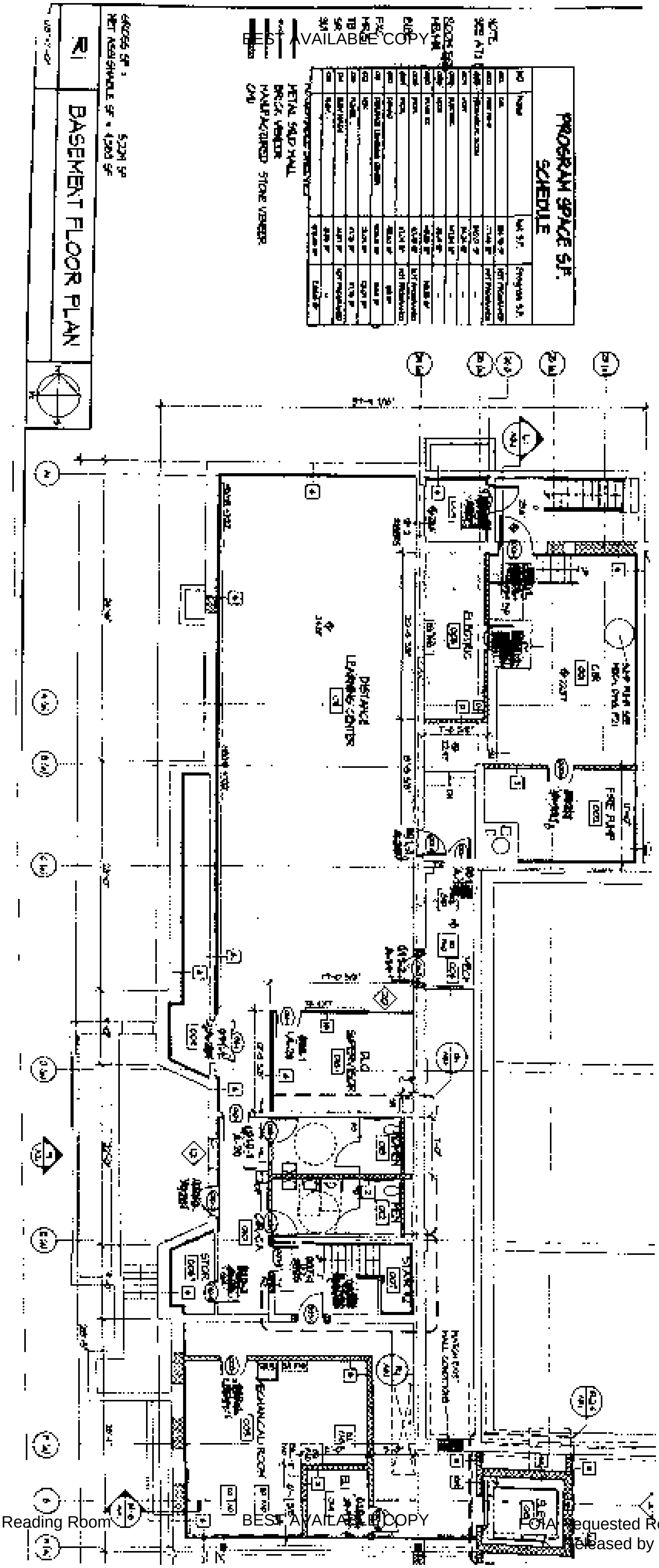
FMS on Property

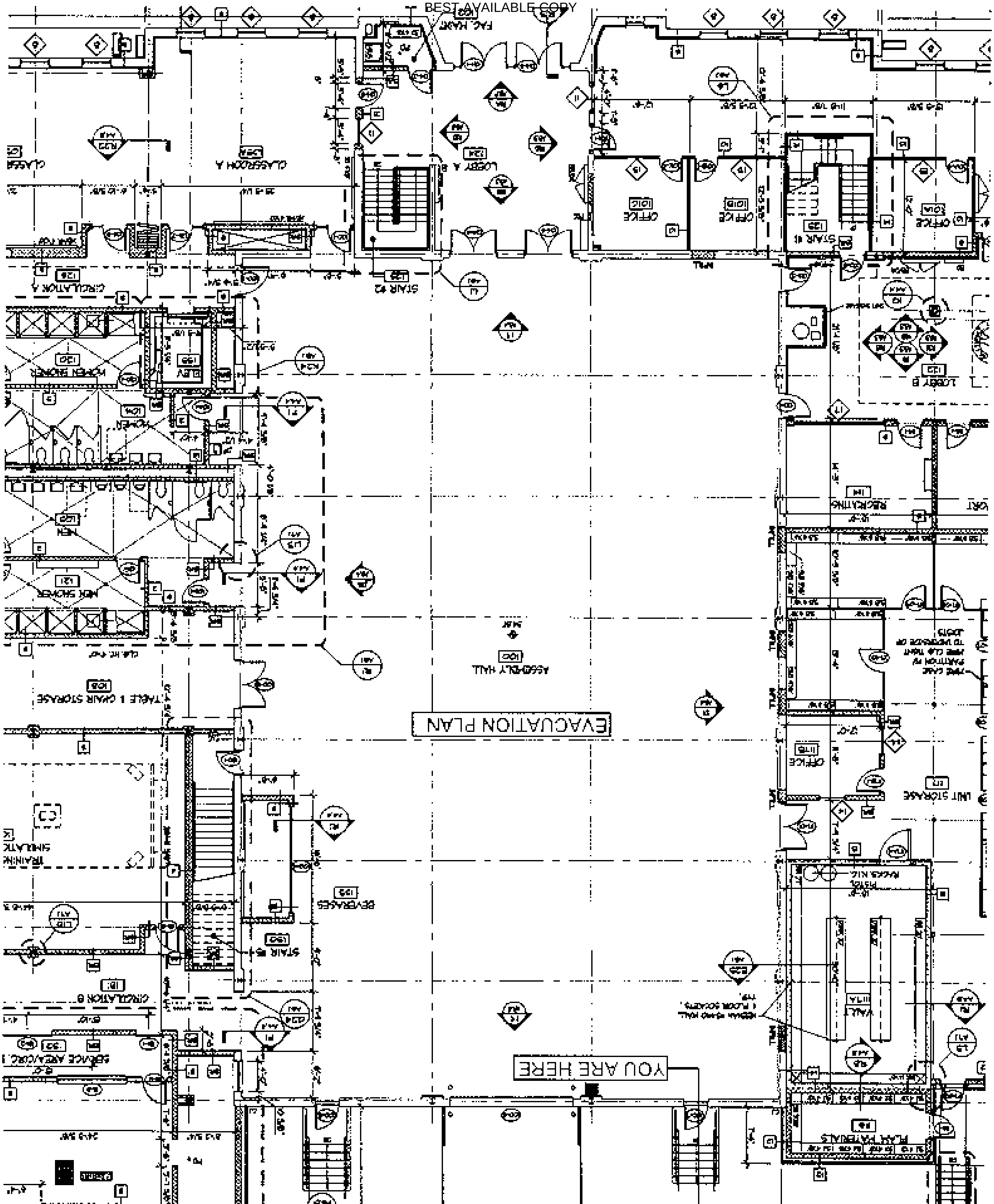
Open Drill Hall Door

Appendix C. Floor Plan

BEST AVAILABLE COPY


DAVIS
BOWEN &
FRIEDEL, INC.
ADDITIONS & ALTERATIONS TO THE
SALISBURY READINESS CENTER
A13


PROGRAM SPACE S.F. SCHEDULE
BASEMENT FLOOR PLAN
DISTANCE LEARNING CENTER
ELECTRIC
FIRE PUMP
MECHANICAL ROOM
STAIR
METAL STUD WALL
BRICK VENEER
MANUFACTURED STONE VENEER
CMU



BEST AVAILABLE COPY

Appendix D. References

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

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

BEST AVAILABLE COPY

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

MCHB-TS-OFS

MAY 1 1 2007

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

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

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

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

FOR THE COMMANDER:

[redacted]

Encl

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

Readiness thru Health

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

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

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

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

Readiness Thru Health

DESTRUCTION NOTICE - Destroy by any method that will prevent disclosure of contents or reconstruction of the document.

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

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

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

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

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

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

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

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

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

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

BEST AVAILABLE COPY

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

1. PURPOSE. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) MG George M. Gelston Armory, Silver Spring, MD, to identify and measure the existence and extent of potentially hazardous operations or conditions. This survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee.

2. CONCLUSIONS. The significant health and safety concerns were: surface lead levels in one area of the former indoor firing range (IFR) and in one office; a potential presence of asbestos pipe insulation; leaks causing mold growth; and the lack of written Occupational Safety and Health (OS&H) programs.

3. RECOMMENDATIONS.

a. Lead Exposure. Adult exposure: Health RAC (Risk Assessment Code) 3; Child Exposure: Health RAC 4.

(1) Clean the former IFR and other areas where sampling results showed elevated levels of lead. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. See Appendix D of the report and National Guard Pamphlet 420-15 for lead cleaning guidance.

(2) Discontinue advertising this facility for use by young children. Address all potential lead hazards before continuing to extend this facility for use by children. If children will continue to use this facility, clean surfaces to the Environmental Protection Agency lead in dust standard for young children and clean all remaining areas to the National Guard Bureau Region North Industrial Hygiene Office and United States Army Center for Health Promotion and Preventive Medicine maximum level for lead on frequently contacted surfaces.

BEST AVAILABLE COPY

b. Asbestos. No RAC can be assigned. Review records to determine whether an asbestos survey has been performed. If not, perform an asbestos survey. If asbestos is identified, develop and implement an Asbestos Management Plan.

c. Mold Exposure. Health RAC 4. Abate all areas of visible mold. Remove and replace ceiling tiles that have mold growth. Follow the guidance in Appendix E of the report.

d. OS&H Programs. No RAC can be assigned. Locate and review site-specific OS&H programs. If these are outdated or do not exist, develop and implement new ones.

BEST AVAILABLE COPY

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

CONTENTS

BEST AVAILABLE COPY

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

1. REFERENCES. See Appendix A.

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

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

4. GENERAL.

a. Personnel Contacted. SGM [redacted], White Oak Armory, 12200 Cherry Hill Road, Silver Spring, MD 20904-1690. Mr. [redacted], who had been the Armory caretaker for thirty-five years, supplied additional information on building maintenance.

b. Survey Personnel. This survey was conducted on 5 August 2003 by Ms [redacted], Industrial Hygienist, United States Army Center for Health Promotion and Preventive Medicine (USACHPPM).

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

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

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

5. METHODOLOGY.

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

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

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

6. FINDINGS AND DISCUSSION.

a. Description of Operations. The Armory contained a Drill Hall, a Classroom, offices, and storage spaces.

b. Occupational Safety and Health (OS&H) Programs. No records of OS&H programs could be found.

c. Building Condition. The buildings had been well maintained and were generally in good condition except for leaks in the ceilings of several areas of the Armory building. The building caretaker stated that the water was entering through the kitchen vent rather than through the roof.

BEST AVAILABLE COPY

d. Indoor Environmental Quality.

(1) Heating, Ventilation, and Air-Conditioning Systems. The Armory had a central gas-fired heating and air-conditioning system. The ductwork on the personnel side of the Armory had been professionally cleaned in 2003.

(2) Mold. Mold was growing on ceiling tiles in the classroom due to the leaks described above.

e. Lead Hazards.

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

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

BEST AVAILABLE COPY

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

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

f. Other Chemical Hazards. Asbestos. The age of the building made the presence of asbestos possible. There was no knowledge of abatement work, and we observed pipe insulation that was possibly asbestos-containing material.

7. CONCLUSIONS. The significant health and safety concerns were: surface lead levels in one area of the former IFR and in one office; a potential presence of asbestos pipe insulation; leaks causing mold growth; and the lack of written OS&H programs.

8. RECOMMENDATIONS.

a. Lead Exposure. Adult exposure: Health RAC 3; Child Exposure: Health RAC 4.

(1) Clean the former IFR and other areas where sampling results showed elevated levels of lead. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. See Appendix D and National Guard Pamphlet 420-15 for lead cleaning guidance.

BEST AVAILABLE COPY

(2) Discontinue advertising this facility for use by young children. Address all potential lead hazards before continuing to extend this facility for use by children. If children will continue to use this facility, clean surfaces to the EPA lead in dust standard for young children and clean all remaining areas to the NGB Region North Industrial Hygiene Office and USACHPPM maximum level for lead on frequently contacted surfaces.

b. Asbestos. No RAC can be assigned. Review records to determine whether an asbestos survey has been performed. If not, perform an asbestos survey. If asbestos is identified, develop and implement an Asbestos Management Plan.

c. Mold Exposure. Health RAC 4. Abate all areas of visible mold. Remove and replace ceiling tiles that have mold growth. Follow the guidance in Appendix E.

d. The OS&H Programs. No RAC can be assigned. Locate and review site-specific OS&H programs. If these are outdated or do not exist, develop and implement new ones.

9. ADDITIONAL ASSISTANCE. For additional assistance or questions concerning this report, please contact the undersigned at commercial (410) 436-5474/3118, DSN 584-5474/3118 or electronic mail: [redacted]@us.army.mil

[redacted]

[redacted] M.S.
Industrial Hygienist
Industrial Hygiene Field Services Program

APPROVED:

[redacted]

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

APPENDIX A

REFERENCES

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

2. EPA, 40 CFR Part 745, Lead; Identification of Dangerous Levels of Lead; Final Rule, 5 Jan 2001.

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

4. National Guard Pamphlet 420-15, Facilities Engineering, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.

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

APPENDIX B

PHOTOGRAPHS

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

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

Photograph 1.

Photograph 2.

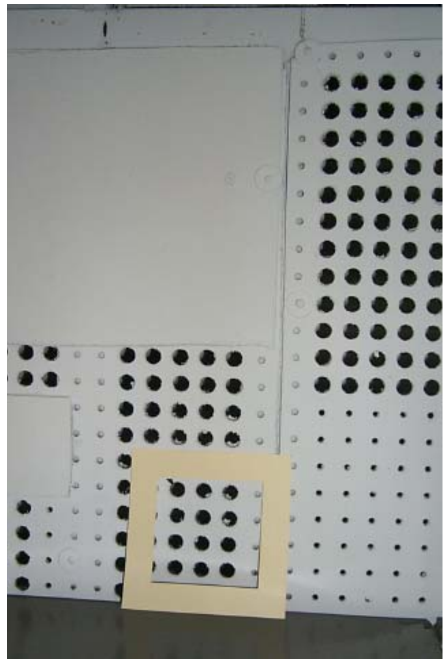
Photograph 3.

Photograph 4.

BEST AVAILABLE COPY

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

Photograph 5.



Photograph 6.

Photograph 7.

Photograph 8.

BEST AVAILABLE COPY

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

Photograph 9.

Photograph 10.

Photograph 11.

Photograph 12.

BEST AVAILABLE COPY

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

Photograph 13.

Photograph 14.

Photograph 15.

Photograph 16.

BEST AVAILABLE COPY

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

Photograph 17.

BEST AVAILABLE COPY

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

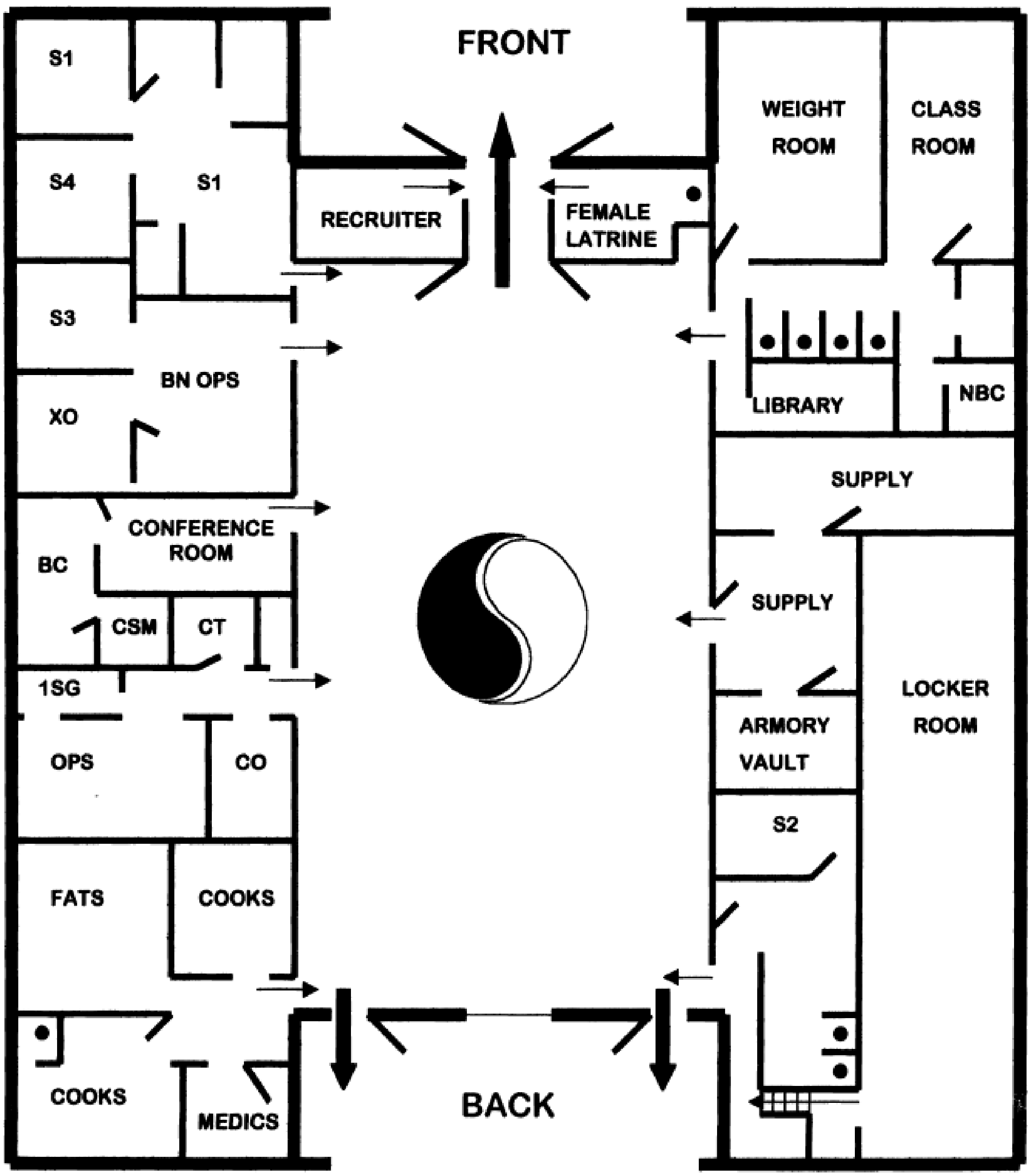
APPENDIX C

FLOOR PLAN

BEST AVAILABLE COPY

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

MG GEORGE M. GELSTON ARMORY
FIRE EVACUATION PLAN



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

APPENDIX D

LEAD ASSESSMENT CRITERIA

Subject: Recommendations for Surface Lead Dust in Armories

1. In armories that do not contain childcare facilities, the National Guard Bureau (NGB) Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 micrograms per square foot (µg/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 µg/ft^2) and windowsills (250 µg/ft^2) in residential dwellings and child occupied facilities. A child occupied facility is defined as a building, or portion of a building, constructed prior to 1978, visited regularly by the same child, 6 years of age or under, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hours and the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60 hours. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

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

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

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

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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

APPENDIX E

LABORATORY REPORT

BEST AVAILABLE COPY

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

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 96596-1**
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 96596-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you should have any questions about this report, please feel free to call me at 303-964-1986.

Sincerely,

[redacted]

President

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

RESERVOIRS ENVIRONMENTAL, INC.
NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD BY WIPE SAMPLING

RES Job Number:	**RES 96596-1**
Client:	**Army National Guard IH - West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**None Given**
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.)
SPBLANK01	EM 806502	0.11	BDL	23	BDL
SPW01	EM 806503	0.11	BDL	23	BDL
SPW02	EM 806504	0.11	BDL	23	BDL
SPW03	EM 806505	0.11	17.3	23	157
SPW04	EM 806506	0.11	BDL	23	BDL
SPW05	EM 806507	0.11	4.5	23	41
SPBLANK02	EM 806508	0.11	BDL	23	BDL
SPW06	EM 806509	0.11	56.3	23	512
SPW07	EM 806510	0.11	3.8	23	35
SPW08	EM 806511	0.11	BDL	23	BDL
SPW09	EM 806512	0.11	BDL	23	BDL
SPW10	EM 806513	0.11	BDL	23	BDL
SPW11	EM 806514	0.11	BDL	23	BDL
SPW12	EM 806515	0.11	BDL	23	BDL
SPW13	EM 806516	0.11	BDL	23	BDL
SPBLANK03	EM 806517	0.11	BDL	23	BDL
FRBLANK01	EM 806518	0.11	BDL	23	BDL
FRW01	EM 806519	0.11	91.7	23	834
FRW02	EM 806520	0.11	6.3	23	57
FRW03	EM 806521	0.11	BDL	23	BDL
FRW04	EM 806522	0.11	3.0	23	27
FRW05	EM 806523	0.11	BDL	23	BDL
FRBLANK02	EM 806524	0.11	BDL	23	BDL
FRW06	EM 806525	0.11	BDL	23	BDL
FRW07	EM 806526	0.11	10.7	23	97

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

BDL = Below Detection Limit

Page 2 of 2

Data Qa

BEST AVAILABLE COPY

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

APPENDIX F

LEAD CLEANING GUIDANCE

BEST AVAILABLE COPY

Chapter 14: Cleaning

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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).

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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.

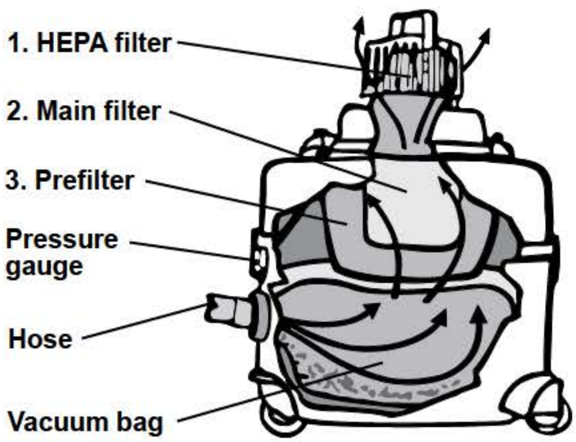
To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture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

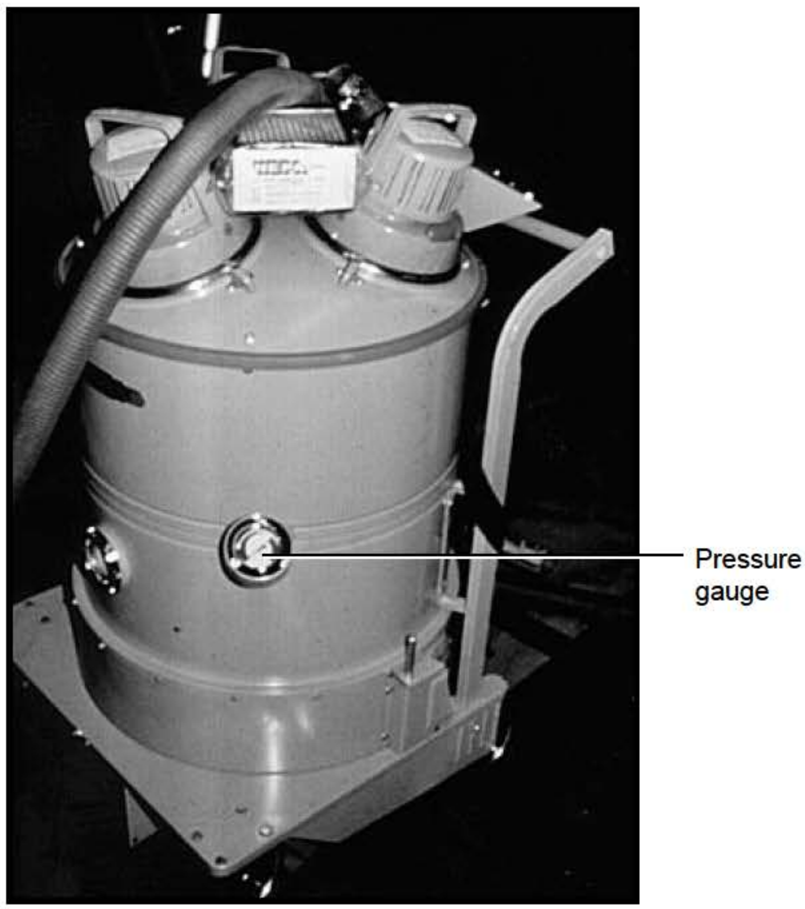
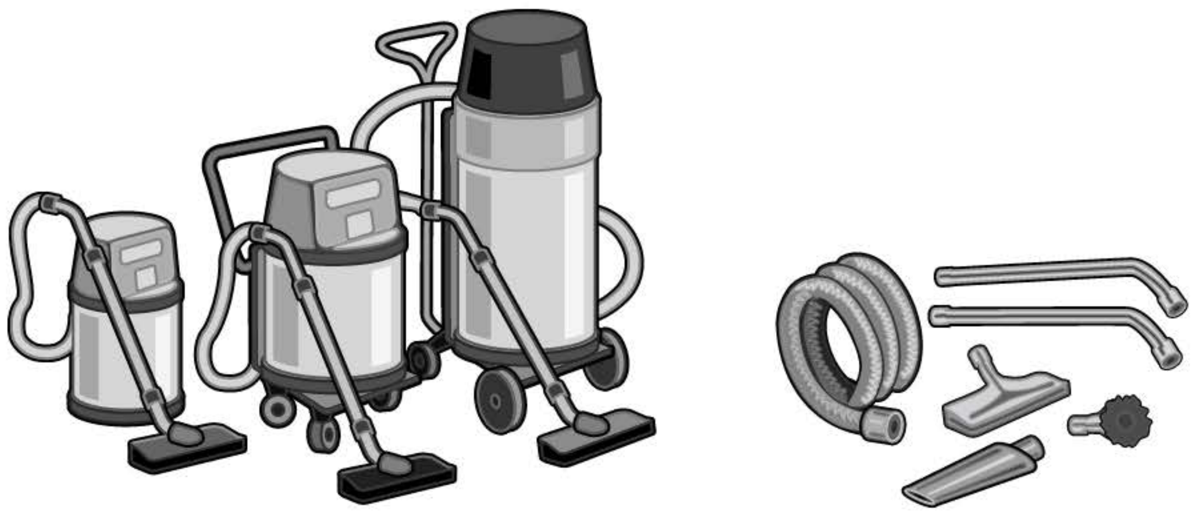


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

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.

Latex — Neoprene — Nitrile

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

3. The HEPA/Wet Wash/HEPA Cycle

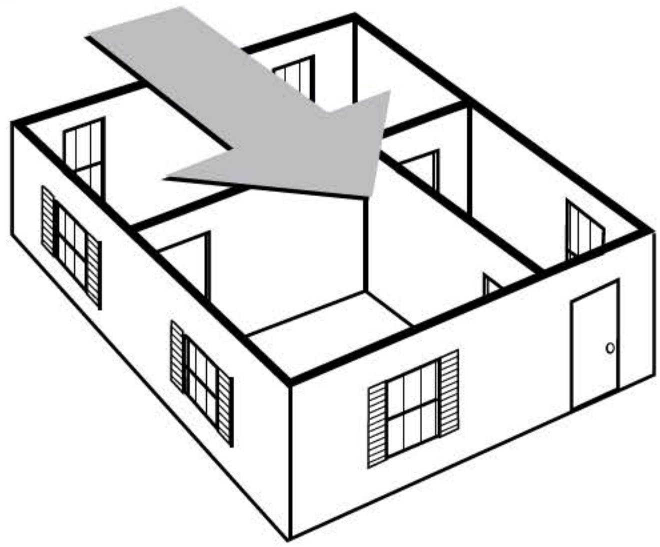
Typical Procedures

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

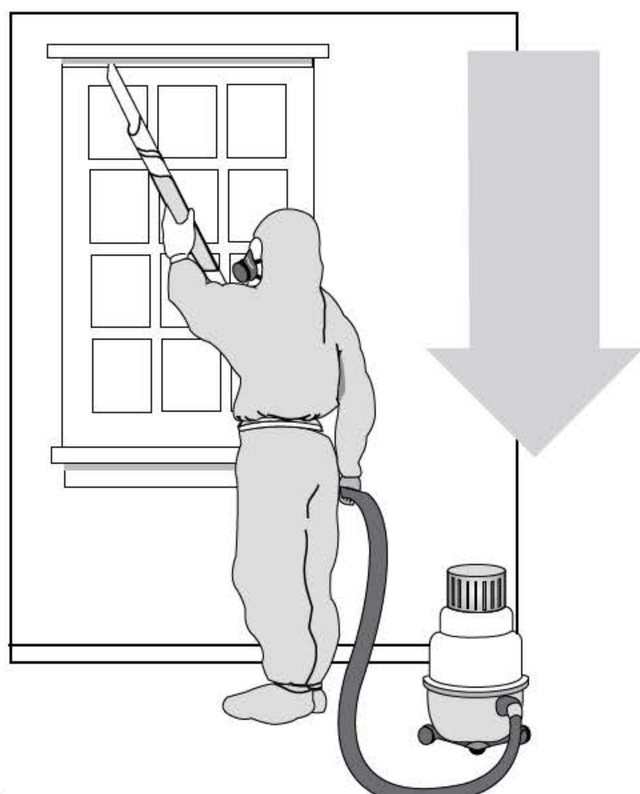
- First, the area is HEPA vacuumed.

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

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



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



Courtesy: Alice Hamilton Occupational Health Center

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

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

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

Single-Pass Wet Wash/HEPA Vacuum

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

Figure 14.4b (continued)

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

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

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

Rubber Cone

Dust Brush

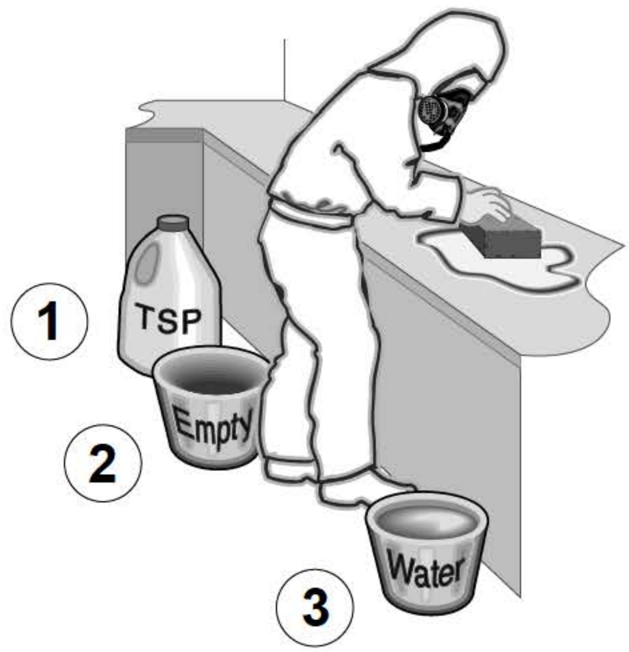
Powered Carpet Beater

Wheeled Floor Nozzle

BEST AVAILABLE COPY

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

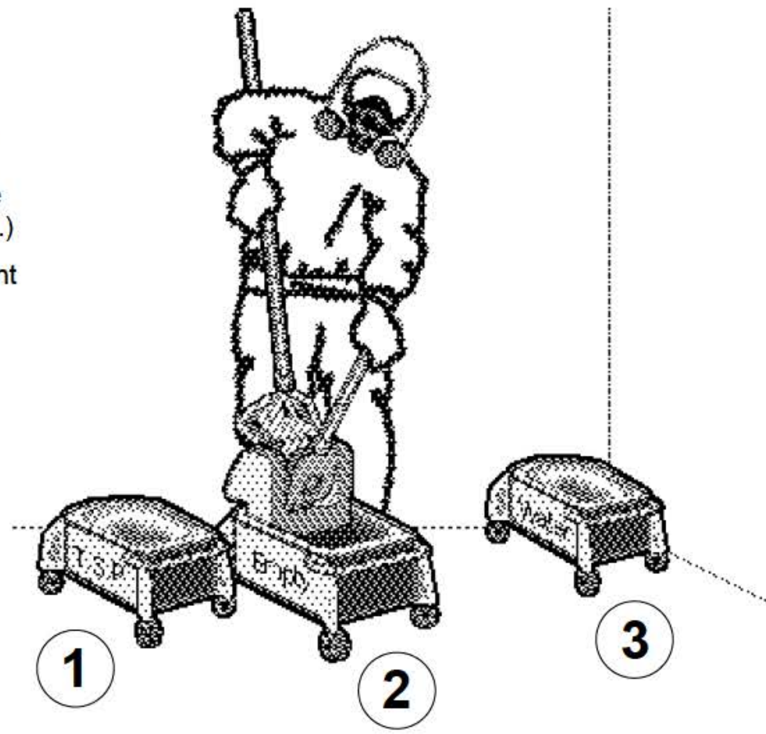
Don't Dry Sweep

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.

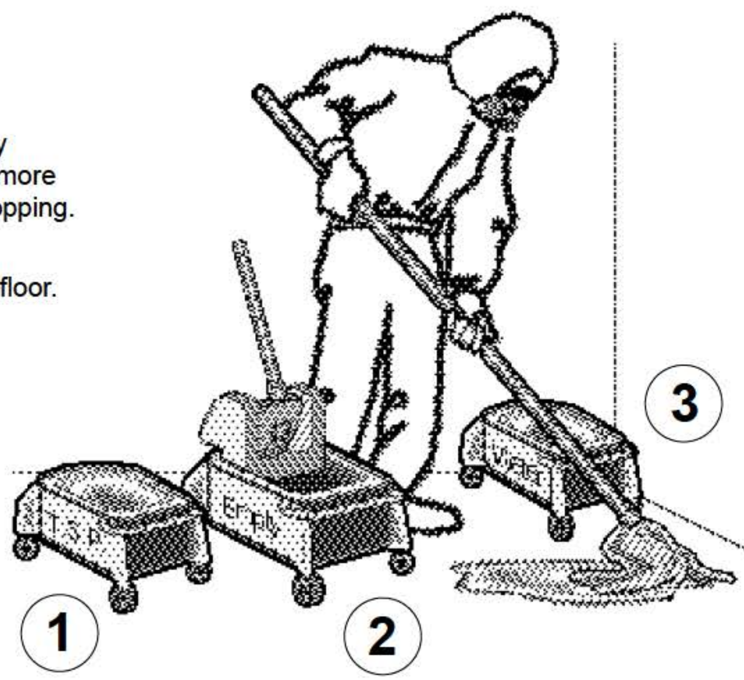
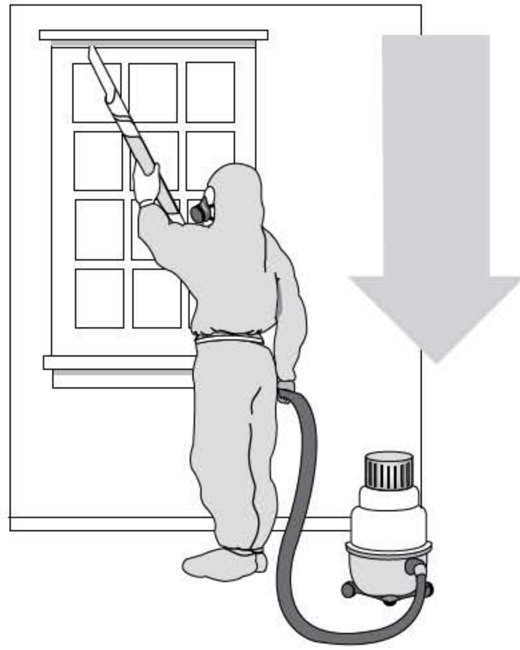


Figure 14.4d (continued)

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.

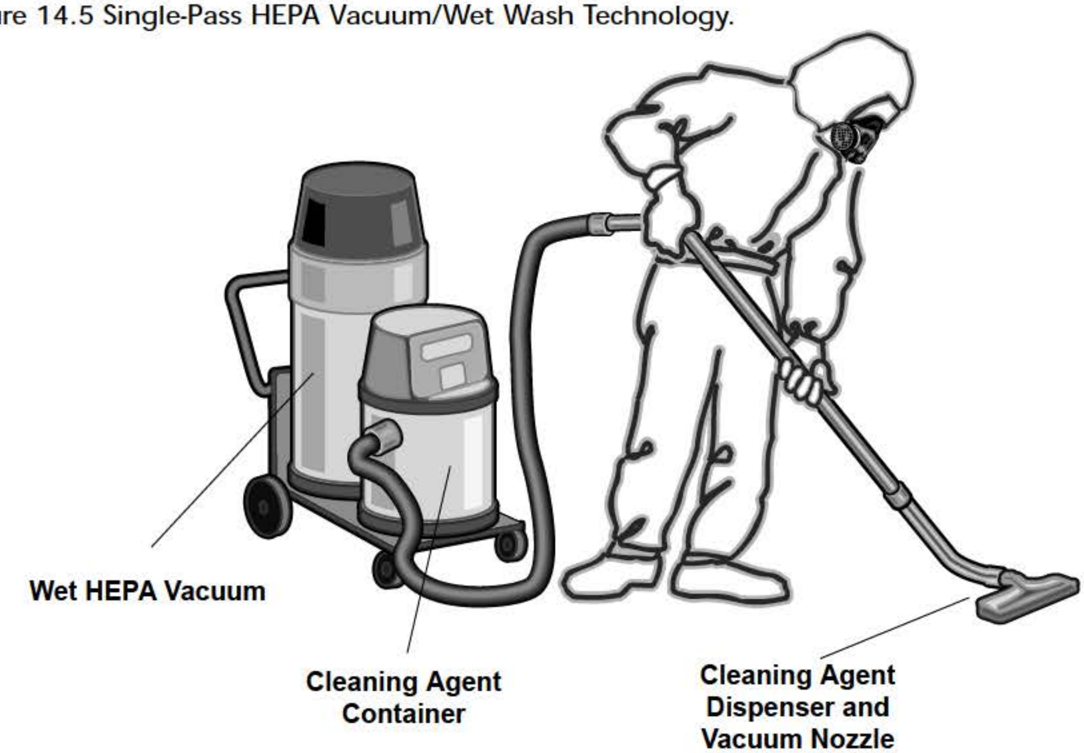
IV. Order of Cleaning Procedures During Lead Hazard Control

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).

BEST AVAILABLE COPY

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)

BEST AVAILABLE COPY

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

APPENDIX G

MOLD CLEANING GUIDANCE

BEST AVAILABLE COPY

Army Facilities Management Information Document on Mold Remediation Issues

TG 277
FEBRUARY 2002

USACHPPM
Readiness thru Health

BEST AVAILABLE COPY

ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

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.

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.

BEST AVAILABLE COPY

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

BEST AVAILABLE COPY

£ 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.

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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).

BEST AVAILABLE COPY

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

BEST AVAILABLE COPY

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.

Local Reproduction is Authorized and Encouraged.

USACHPPM
Readiness thru Health

BEST AVAILABLE COPY

Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278
February 2002

USACHPPM
Readiness thru Health

Table of Contents

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.

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.

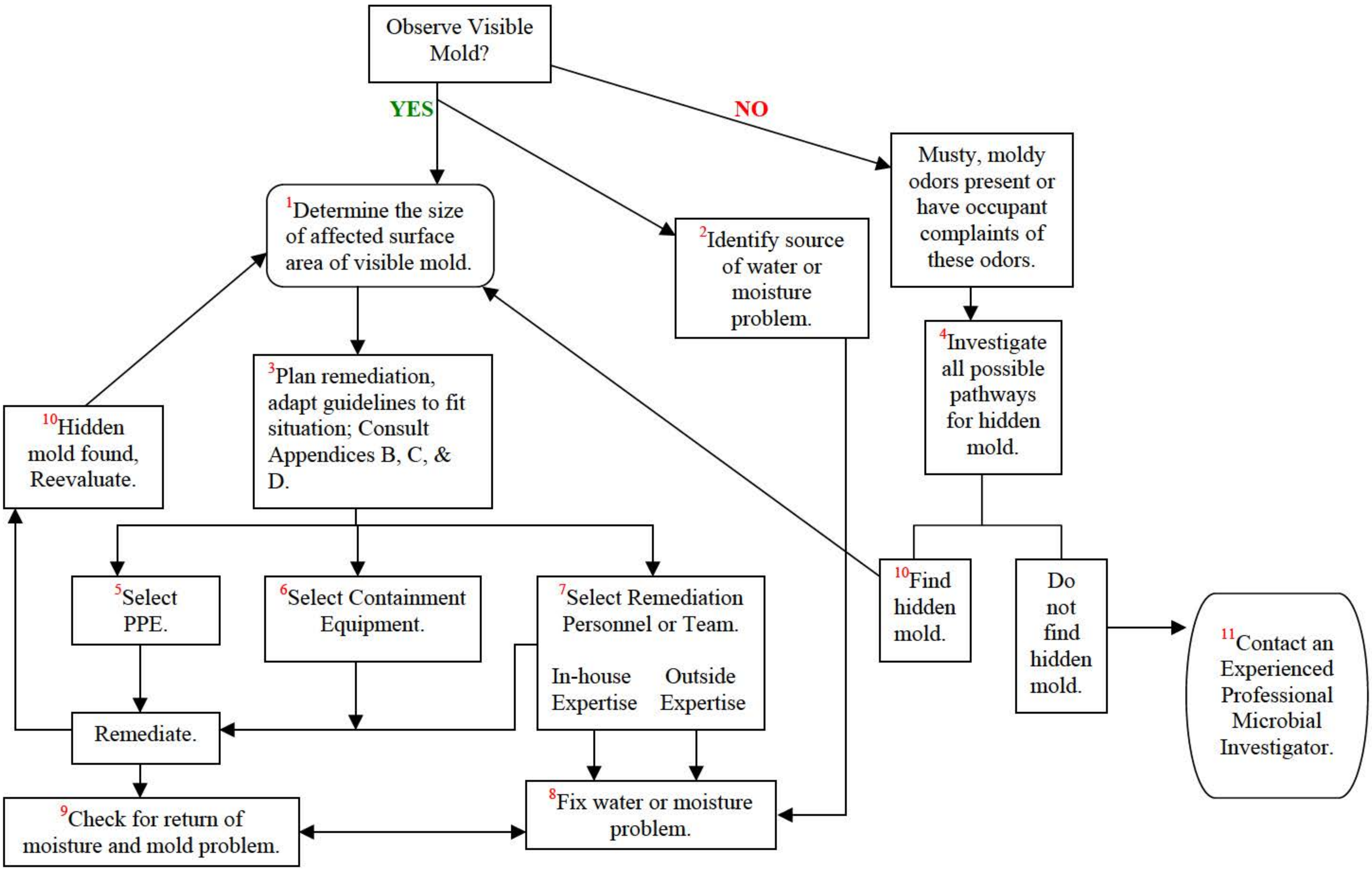
7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

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.

Local Reproduction is Authorized and Encouraged.

USACHPPM
Readiness thru Health

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: Industrial Hygiene Assessment Report
Silver Spring Readiness Center, Silver Spring, 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 Silver Spring, 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

ENGINEERS

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

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

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

Prepared and submitted by:

Non-Responsive [redacted]
Non-Responsive
Industrial Hygienist

Certified Industrial Hygienist review by:

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

TABLE OF CONTENTS

TABLES

ENGINEERS

APPENDIX

BEST AVAILABLE COPY

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 it in performing an Industrial Hygiene assessment at the Army National Guard (ARNG) Readiness Center (RC) located at 12200 Cherry Hill Road in Silver Spring, Maryland. The purpose of the Industrial Hygiene survey was to identify and measure the existence and extent of potentially hazardous operations or conditions at the ARNG facility. Mr. [redacted]o, 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: SGT. Sergio Alcantara, Supervisor, Silver Spring Readiness Center

1.2 Facility Description

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

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

1.3 Findings and Conclusions

The main findings and conclusions of the assessment are:

- On the day of the assessment there were six on-site personnel, one supervisor, four maintenance personnel and one caretaker. During a normal 10-hour day, the supervisor performs logistical work while the maintenance personnel and caretaker maintain the facility and grounds.

- Airborne lead was not detected in either of the two area air samples collected on the day of the assessment. The airborne lead concentrations in each of the air samples were reported at less than 3.3 micrograms of lead per cubic meter of air ($\mu g/m^3$), which is well below the OSHA Action Level of 30 $\mu g/m^3$ for lead over an 8-hour workday.

- Wipe samples for lead that were collected from various horizontal surfaces throughout the Readiness Center indicated that the surface lead concentrations in certain areas exceeded the recommended precautionary level of 200 micrograms of lead per square foot of surface sampled ($\mu g/ft^2$). 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 several areas throughout the facility, specifically the office areas, kitchen and various storage rooms, were below the recommended values. Although the lower-than-recommended lighting levels are not expected to present an imminent hazard, safety and ergonomic improvements could result from enhanced lighting in these areas.

- Building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. IES did not observe deteriorating paint or suspected asbestos-containing building materials during the IH assessment. Furthermore, IES did not observe indications of mold and bacteria growth.

- The air temperatures within the facility ranged from 75.1°F to 84.1°F, as compared to an outdoor temperature of 93.9°F. Some of the temperatures in the areas of the building outside of the offices on the northeast side exceeded what is considered comfortable, as recommended by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). Relative humidity levels througout the facility were within the 30 to 60% range as recommended by ASHRAE. IES was informed by the caretaker on the day of the survey that the roof-top air-handling unit serves only the offices located within the northeast section of the builing. The rest of the building is naturally ventilated through open windows and doors.

1.4 Recommendations

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

IES ENGINEERS

2.0 OPERATION DESCRIPTION

INSTALLATION: RC Army National Guard
BUILDING: 12200 Cherry Hill Road, Silver Spring, Maryland
LOCATION: Site wide

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

CHEMICAL AND PHYSICAL AGENTS SAMPLED: Area sampling for lead was performed on the day of the assessment during what is considered routine operations when training is not taking place at the facility. General IAQ measurements were made throughout the facility to evaluate ambient conditions on the day of the assessment.

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

LIGHTING: The average illuminance levels in several areas throughout the shop were below the recommended values. Refer to Section 3.3 of this report for a summary of the lighting measurements.

INTERPRETATION OF RESULTS: The area lead sample results suggest that the likelihood of personnel exposure to airborne lead dust is low. Wipe samples for lead that were collected from various horizontal surfaces throughout the Readiness Center indicated that the surface lead concentrations in certain areas exceeded the recommended precautionary level of 200 $\mu g/ft^2$. Although there is limited correlation between surface lead contamination and airborne lead exposures, it is recommended that the affected areas be thoroughly cleaned using HEPA filtered vacuum systems and/or wet methods. The average illuminance levels in both areas of the facility were below the recommended values. Although the lower-than-recommended lighting levels are not expected to present an imminent hazard, safety and ergonomic improvements could result from enhanced lighting in these areas. Building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. IES did not observe deteriorating paint or suspected asbestos-containing building materials during the IH assessment. Furthermore, IES did not observe indications of mold and bacteria growth. Temperatures collected within the areas outside of the northeast offices, exceeded ASHRAE's recommendation of a range of 68°F to 79°F, on the day of the assessment.

ENGINEERS

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 17, 2008
Location: National Guard RC, Silver Spring, 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 62-2007)[(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	**Conference Room** - Area Sample (AS) – Approximately four feet above the ground at the center of the Conference Room.	1020 – 1024	4 Min.	**520**	**0**	**75.4**	**51.0**
B	**Office Area (102)** – AS – Approximately four feet above the floor at the center of the office are.	1024 - 1028	4 Min.	**567**	**0**	**75.1**	**41.3**
C	**Drill Hall** – AS – Approximately four feet above the floor at the center of the Drill Hall	1028 - 1032	4 Min.	**445**	**0**	**84.1**	**42.1**
D	**Office 102B** – AS – Approximately four feet above the floor at the center of Office 102B.	1032 - 1036	4 Min.	**459**	**0**	**76.4**	**41.5**

IES ENGINEERS

Sample ID	Sample Description	Start - End Time (hh:mm)	Sample Time	CO_2 (ppm)	CO (ppm)	Measured Temperature (°F)	Measured Relative Humidity (%)
E	**Outdoor** – AS – Approximately four feet above the ground outside of the RC.	1036 - 1040	4 Min.	**382**	**0**	**93.9**	**54.2**
F	**Caretaker's Office** – AS – Approximately four feet above the floor at the center of the Caretaker's Office	1040 - 1044	4 Min.	**598**	**0**	**82.3**	**56.2**
G	**Classroom** – AS – Approximately four feet above the floor at the center of Classroom 108A.	1044 - 1048	4 Min.	**423**	**0**	**81.4**	**42.2**
H	**Medics** – AS – Approximately four feet above the floor at the center of the Medics Office.	1048 - 1052	4 Min.	**444**	**0**	**80.8**	**41.9**
I	**Locker Room** – AS – Approximately four feet above the ground inside the Locker Room	1052 - 1056	4 Min.	**624**	**0**	**78.3**	**48.4**
J	**Recruiter's Office** – AS – Approximately four feet above the ground inside the Recruiter's Office	1056 - 1100	4 Min.	**378**	**0**	**80.8**	**54.0**

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

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

3.1.2 Airborne Lead Sampling

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

Air sample results for lead were compared to the Action Level and Permissible Exposure Limits (PELs) published in OSHA 1910.1025, the expanded health standard for lead. Action Levels and PELs are promulgated through the OSHA rule-making process and act as legal limits for exposure in the work place. They are intended to provide protection to employees who are potentially exposed to airborne contaminants. The Action Level for lead is expressed in terms of an 8-hour time-weighted average (TWA) contaminant concentration. The PELs for lead are expressed in terms of 8-hour TWAs. Copies of the OSHA regulations are available through the local OSHA Area Office, in the Federal Register, or on the OSHA website at *www.osha.gov*.[4]

This report's findings are based on the lead samples collected during the assessment, which are summarized in Table 2. Refer to Appendix C for the complete laboratory air sample analysis results. Worksite Sampling Data Records are included in a separate document entitled, "Silver Spring_RC_08_Medical."

TABLE 2
AIRBORNE LEAD SAMPLING RESULTS SUMMARY

Date of Monitoring: July 17, 2008
Location: Army National Guard RC, Silver Spring, Maryland
Analyte(s): Lead
Occupational Exposure Limits: OSHA PEL-TWA = 50 μg/m^3
OSHA Action Level (TWA) = 30 μg/m^3

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

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

3.2 Lead Dust Sampling

IES performed wipe sampling in the Drill Hall, converted rifle range and in select areas throughout the facility. All wipe sampling was performed in accordance with: best Industrial Hygiene practices and the guidelines published in Section II: Chapter 2, Sampling for Surface Contamination, of the OSHA Technical Manual. The wipe samples were collected over 100 square inch areas using pre-wetted Ghost Wipes. The wipe samples collected as a part of this assessment, along with appropriate field blanks, were shipped to AMA for analysis and were analyzed using the NIOSH 7082 flame atomic absorption spectrophotometer (FAAS) method. All wipe sample results were reported in micrograms of lead per square foot of surface sampled (μg/ft^2) for the purposes of this assessment.

This report's findings are based on the lead samples collected during the assessment, which are summarized in Table 3. Refer to Appendix D for sample locations and Appendix C for the complete laboratory wipe sample analysis results. Worksite Sampling Data Records are included in a separate document entitled, "Silver Spring_RC_08_Medical."

TABLE 3 – WIPE SAMPLE RESULTS SUMMARY

Date of Monitoring: July 17, 2008
Location: Army National Guard RC, Silver Spring, Maryland
Analyte(s): Lead
Occupational Exposure Limits: ARNG Recommended Cleaning Level = 200 µg/ft^2

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

3.3 Illuminance Survey

The illumination survey was performed pursuant to best Industrial Hygiene practices and the guidelines found in the ARNG document entitled, "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," dated November 17, 2007.[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.

TABLE 4
ILLUMINANCE READINGS SUMMARY

Survey Dates: July 17, 2008
Location: Army National Guard RC, Silver Spring, Maryland

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

Notes: - All illuminance measurements and recommended values are expressed in foot candles (fc)

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

4.0 ONSITE OBSERVATIONS

A copy of IES' field notes from this assessment is included in a separate document entitled, "Silver Spring_RC_08_Field_Notes."

4.1 Physical Condition of RC

All building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. IES observed all presumed asbestos-containing materials (PACM) and facility paint were in good condition. IES did not observe indications of mold and bacteria growth. No building material samples were collected on the day of the survey.

4.2 Housekeeping

Housekeeping within the facility was generally good. IES observed no imminent slip, trip and fall hazards on the day of the assessment. All furniture within the offices and training areas were properly maintained within the rooms.

5.0 EQUIPMENT AND CALIBRATION DATA

5.1 Sampling Equipment List

Table 5 lists the sampling equipment that was used as a part of the assessment.

TABLE 5
SAMPLING EQUIPMENT LIST

Equipment Type	Make/Model	Equipment/Serial Number	Equipment Identification
Personal Sampling Pump	MSA Escort ELF	110	110
Personal Sampling Pump	MSA Escort ELF	103	103
Primary Gas Flow Calibrator (Electronic Frictionless Piston)	Bios DryCal DC-Lite Model DCL-HM; S/N 101785	DryCal-ML	DryCal-ML
Light Meter	Extech Light Meter	401025	401025
Indoor Air Quality Monitor	TSI Model 8551 Q-Trak	51885	Q-Trak

5.2 Sampling Equipment Calibration Data

Table 6 details the calibration data for each piece of sampling equipment used during the assessment.

ENGINEERS

TABLE 6
SAMPLING EQUIPMENT CALIBRATION DATA

Equipment ID	Calibrator Used	Date of Pre-Sampling Calibration	Pre-Sampling Calibration Value (lpm)	Date of Post-Sampling Calibration	Post-Sampling Calibration Value (lpm)	Average Calibration Value (lpm)
110	DryCal-ML	7/17/08	2.05	7/17/08	2.03	2.04
103	DryCal-ML	7/17/08	1.93	7/17/08	1.91	1.92
DryCal-ML	Bench Calibrated 02/07/08	N/A	N/A	N/A	N/A	N/A
401025	NA	NA	NA	NA	NA	NA
Q-Trak	Zero Gas/ Span Gas	7/17/08	Zero Gas: 0 ppm CO_2; 0 ppm CO Span Gas 1,000 ppm CO_2; 35 ppm CO	7/17/08	Zero Gas: 0 ppm CO_2; 0 ppm CO Span Gas 1,000 ppm CO_2; 35 ppm CO	Zero Gas: 0 ppm CO_2; 0 ppm CO Span Gas 1,000 ppm CO_2; 35 ppm CO

7.0 REFERENCES

1. ACGIH, *2008 TLVs and BEIs*.
2. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), Standard 62-2007, "Ventilation for Acceptable Indoor Air Quality," ASHRAE, Atlanta, Georgia, 2004.
3. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), Standard 55-2004, "Thermal Environmental Conditions for Human Occupancy," ASHRAE, Atlanta, Georgia, 2004.
4. Occupational Safety and Health Administration, 29 CFR 1910.1025, Lead.
5. "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," ARNG, 17 November 2007.

APPENDIX A

FACILITY PHOTOGRAPHS

ENGINEERS

Photograph #1 – RC Exterior

Photograph #2 – RC Assembly Hall

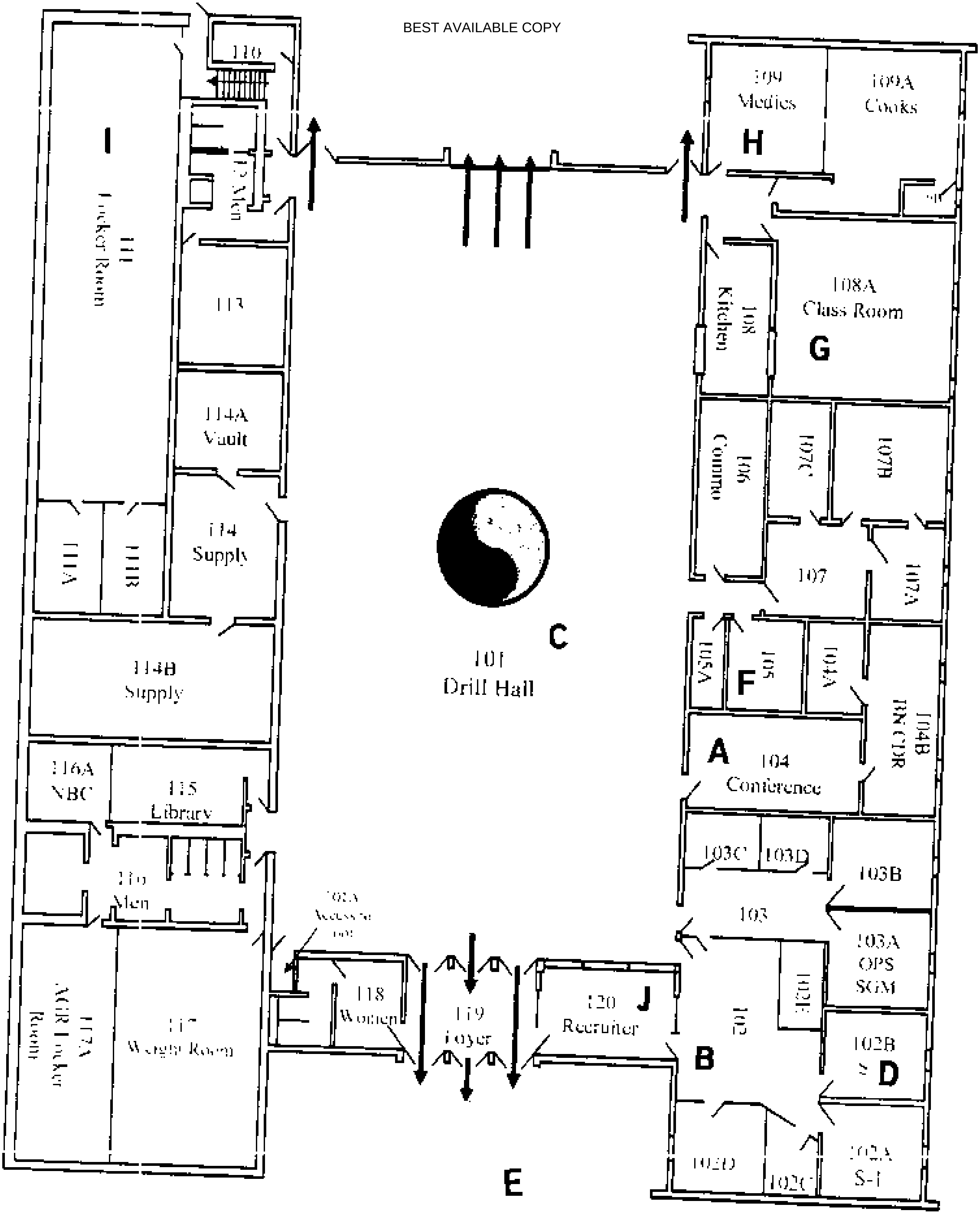
BEST AVAILABLE COPY

Photograph #3 – RC Kitchen

Photograph #4 – Converted Rifle Range

APPENDIX B

INDOOR AIR QUALITY SAMPLE LOCATION MAP



SILVER SPRING READINESS CENTER
IAQ SURVEY MAP

APPENDIX C

AIR AND WIPE SAMPLING RESULTS

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

100470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Not Provided	**Chain Of Custody:**	159373
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Silver Spring, MD	**Date Submitted:**	7/22/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EHS 08749.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	7/24/2008
				Report Date:	7/24/2008

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
0871106	071708-A001	Flame	Air	908	N/A	3.30	ug/m³	<	3.3	ug/m³	
0871107	071708-A002	Flame	Air	854	N/A	3.51	ug/m³	<	3.5	ug/m³	
0871108	071708-A003	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	
0871109	071708-SW001	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871110	071708-SW002	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871111	071708-SW003	Flame	Wipe	****	0.108	111.52	ug/ft²		1500	ug/ft²	
0871112	071708-SW004	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871113	071708-SW005	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871114	071708-SW006	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871115	071708-SW007	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871116	071708-SW008	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871117	071708-SW009	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871118	071708-SW010	Flame	Wipe	****	0.108	111.52	ug/ft²		450	ug/ft²	
0871119	071708-SW011	Flame	Wipe	****	0.108	111.52	ug/ft²		930	ug/ft²	
0871120	071708-SW012	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0871121	071708-SW013	Flame	Wipe	****	0.108	111.52	ug/ft²		540	ug/ft²	
0871122	071708-SW014	Flame	Wipe	****	0.108	111.52	ug/ft²		110	ug/ft²	
0871123	071708-SW015	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0871124	071708-SW016	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	

BEST AVAILABLE COPY

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

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

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Not Provided	**Chain Of Custody:**	159373
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Silver Spring, MD	**Date Submitted:**	7/22/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EHS 08749.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	7/24/2008 **Report Date:** 7/24/2008
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

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: [redacted]

Technical Manager: [redacted]

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. * Bill National Guard Bureau Region North IH Office Directly
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) 159373 1/2

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

Submittal Information:
1. Job Name:
2. Job Location: Silver Spring, MD
3. Job #: EHS 08749.02 P.O. #:
4. Contact Person: [redacted] @ phone #
5. Submitted by: [redacted] Signature [redacted]

❑ Please include COC/field data sheets with results
Reporting Information (Results will be provided as soon as technically feasible):
Date & Time Results Required: [illegible]/29/08 @ 1700 ❑ Immd. ❑ 24hr ❑ 48hr ❑ 72hr ☒ 5 Day + ❑ Immd. After-Hours* ❑ 24hr After-Hours* ❑ Late-Night* (*must be pre-scheduled)
❑ Verbals: ______ @ cell #: ______ ❑ Fax Copy: ______ @ fax #: ______ ☒ Email Copy [redacted] @ iesengineers.com

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity______ in a 25mm 37mm
❑ NIOSH 7400______(QTY)
❑ Fiberglass______(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity______ in a 25mm 37mm
❑ AHERA______(QTY)
❑ NIOSH 7402______(QTY)
❑ Other (specify______)______(QTY)
PLM Bulk
❑ EPA 600 – Visual Estimate______(QTY)
❑ EPA Point Count______(QTY)
❑ NY State Friable 198.1______(QTY)
❑ Grav. Reduction ELAP 198.6______(QTY)
❑ Other (specify______)______(QTY)

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

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

Lead Analysis
❑ Paint Chip______(QTY)
☒ Dust Wipe (wipe type ghost wipe) 16 (QTY)
☒ Air 3 (QTY)
❑ Soil/Solid______(QTY)
❑ TCLP______(QTY)
❑ Drinking Water______(QTY)
❑ Waste Water______(QTY)
❑ Dust Wipe Furnace (wipe type______)______(QTY)

Mold - Direct Microscopic Analysis
❑ Spore-Trap______(QTY) ❑ Bulk______(QTY)
❑ Surface Swab______(QTY) ❑ Surface Vacuum Dust______(QTY)
❑ Surface Tape______(QTY) ❑ Other (Specify______)______(QTY)

CLIENT ID NUMBER	SAMPLE INFORMATION: SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	AIR	MATRIX: BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
071708-A001		7/17/08	907.8					X		X						
071708-A002			854.4					X		X						
071708-A003			—					X		X						
071708-SW001				100 in²				X				X				
071708-SW002								X				X				
071708-SW003								X				X				
071708-SW004								X				X				
071708-SW005								X				X				
071708-SW006								X				X				
071708-SW007								X				X				
071708-SW008								X				X				
071708-SW009								X				X				
071708-SW010								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: 7/22/08 @ 0955 Via: FedEx By (Print): [redacted] Sign: [redacted]
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ___/___/___ Time: ______ Initials: ______
4. Comments: ______

Bill National Guard Bureau Region 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) 1593 ~~87~~ 93
2/2

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

Submittal Information:
1. Job Name: ____
2. Job Location: Silver Spring, MD
3. Job #: EHS08749.02 P.O. #: ____
4. Contact Perso[redacted] @ phone # ____
5. Submitted by: [redacted] Signature [redacted]

❑ Please include COC/field data sheets with results
Reporting Information (Results will be provided as soon as technically feasible):
Date & Time Results Required: ___/___/___ @ ____ ☐Immd. ☐24hr ☐48hr ☐72hr ☐5 Day + ☐Immd. After-Hours* ☐24hr After-Hours* ☐Late-Night* (*must be pre-scheduled)
❑ Verbals: ____ @ cell # ____ ❑ Fax Copy: ____ @ fax # ____ ☒ Email Copy: [redacted] @ iesengineers.com

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
❑ NIOSH 7400____(QTY)
❑ Fiberglass____(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
❑ AHERA____(QTY)
❑ NIOSH 7402____(QTY)
❑ Other (specify____)____(QTY)
PLM Bulk
❑ EPA 600 – Visual Estimate____(QTY)
❑ EPA Point Count____(QTY)
❑ NY State Friable 198.1____(QTY)
❑ Grav. Reduction ELAP 198.6____(QTY)
❑ Other (specify____)____(QTY)

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

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

Lead Analysis
❑ Paint Chip____(QTY)
☒ Dust Wipe (wipe type ghost wipe) 16 (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

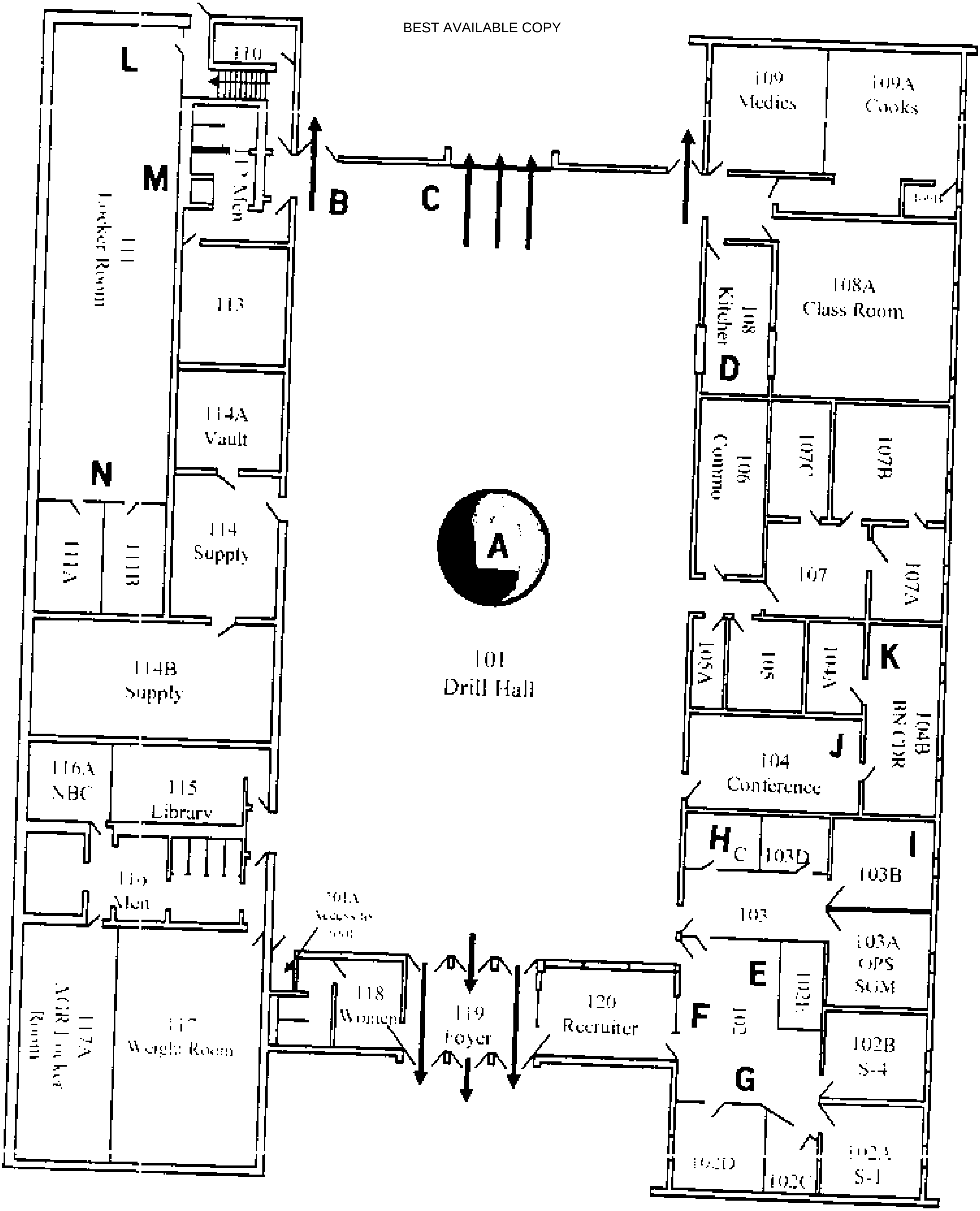
CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
071708-SW011		7/17/08		100 in²				X				X				
071708-SW012				↓				X				X				
071708-SW013				↓				X				X				
071708-SW014				↓				X				X				
071708-SW015				—				X				X				
071708-SW016				—				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 D

LEAD WIPE SAMPLE LOCATIONS MAP

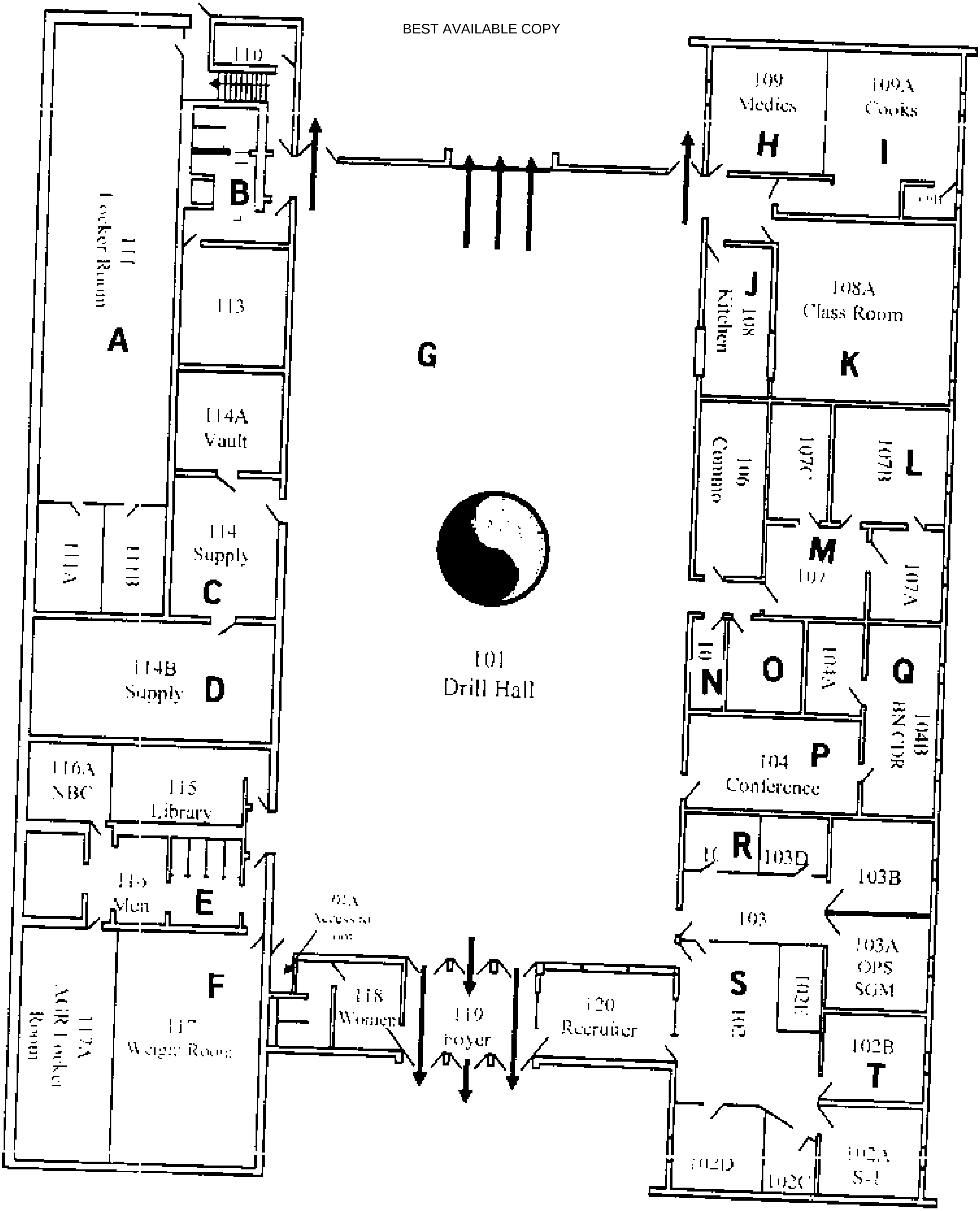


SILVER SPRING READINESS CENTER
LEAD WIPE SAMPLE MAP

ENGINEERS

APPENDIX E

ILLUMINANCE READING MAP



SILVER SPRING READINESS CENTER
ILLUMINATION SURVEY MAP

ANALYTICAL LABORATORY SERVICES, INC.

Environmental ✦ Industrial Hygiene ✦ Field Services

www.analyticallab.com

Industrial Hygiene Survey

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

Prepared For: National Guard Bureau Region North IH
301-IH Old Bay Lane
Havre de Grace, MD 21078

Survey Location: Silver Spring (White Oak) Armory
12200 Cherry Hill Road
Silver Spring, MD 20904

Prepared By: Analytical Laboratory Services, Inc.
3544 North Progress Avenue
Suite 100
Harrisburg, PA 17110

Survey Date: October 7, 2010

Report Date: November 1, 2010

ALSI Project #: 1010665

Non-Responsive [redacted]

Director, Environmental Health & Safety

Table of Contents

Section 1.0
Executive Summary

BEST AVAILABLE COPY

Section 1.0 Executive Summary

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

1. Lead surface and air samples were collected. All sample results were less than recommended guidelines or regulatory standards. Most painted areas were in good condition. Damaged paint was observed in the Drill Hall and Kitchen Supply Room. Paint should be repaired in these areas.

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

3. Indoor air quality parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment. Temperature was slightly lower than the recommended guideline in the converted firing range which is now a locker/storage area. This area is unoccupied most of the time. Relative humidity, carbon dioxide (ventilation) and carbon monoxide levels were within recommended guidelines.

4. A few areas of water damage were observed. All sources of water infiltration should be identified and repaired. Water stained ceiling tile should be removed and replaced.

5. Supply and return vents were dirty. Do not permit dirt, debris, microbial growth, etc. to accumulate in any portion of the HVAC systems including the supply and return vents. Supply and return vents should be cleaned.

6. Exposed, black mastic was observed in the kitchen where vinyl floor tile have been removed and in the Drill Hall on the ceiling where ceiling panels were missing. This is a possible asbestos containing material (ACM) and could present a health concern if it is disturbed. If it is ACM, and there is the potential for disturbance it should be properly abated or enclosed.

BEST AVAILABLE COPY

Section 2.0
Operation Description & Observations

BEST AVAILABLE COPY

Section 2.0 Operation Description & Observations

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

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

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

There is an area of the building that was previously a firing range. It is now a locker/storage area. There is no child-care facility in the building.

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

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

BEST AVAILABLE COPY

Section 3.0
Noise Survey

Section 3.0 Noise Survey

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

BEST AVAILABLE COPY

Section 4.0
Lead Testing

BEST AVAILABLE COPY

Section 4.0 Lead Testing

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

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

Lead Testing Results Summary

Sample #	Location	Air ug/m³	Surface ug/ft²
1	Dill Hall	<3.2	
2	Room 102	<3.3	
3	Blank	<3 (ug)	
4	Drill Hall - Floor (Center)		<110
5	Drill Hall - Tabletop		<110
6	Drill Hall - Kitchen Countertop		<110
7	Converted Firing Range Top of Locker		<110
8	Converted Firing Range – Floor		<110
9	Converted Firing Range - AC Wall Unit Supply Grill		<110
10	Floor Outside Converted Firing Range		<110
11	Room 108A Lounge - Window Sill		<110
12	Kitchen – Top of Refrigerator		<110
13	Room 107 Supply Vent		<110
14	Room 103 – Floor		<110
15	Room 102B – Top of Bookshelf		<110
16	Blank		<12 (ug)
Criteria		**50**	**200**

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

The National Guard Bureau currently utilizes 200 ug/ft² as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for Environmental Chemicals," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft² is a satisfactory surface

BEST AVAILABLE COPY

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.

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

BEST AVAILABLE COPY

Section 5.0
Lighting

BEST AVAILABLE COPY

Section 5.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 4001 Precision Light Meter (Serial No. K070003). The light meter was last calibrated on November 26, 2009. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Drill Hall	16.4	30-50	No
Room 108A Lounge	93.2	30-50	Yes
Kitchen	62.9	50	Yes
Room 107	104.6	30-50	Yes
Room 104	85.8	30-50	Yes
Room 103	141.3	30-50	Yes
Room 102B	145.3	30-50	Yes
Recruit Office	122.2	30-50	Yes
Room 111 Converted Firing Range	132.2	30	Yes

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

BEST AVAILABLE COPY

Section 6.0
Indoor Air Quality

BEST AVAILABLE COPY

Section 6.0 Indoor Air Quality

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

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

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 71.3 to 76.6 degrees F with relative humidity readings ranging from 38.3% to 46.0%. During the survey, carbon dioxide (CO_2) levels ranged from 353 ppm to 757 ppm within the facility compared to an outdoor CO_2 level of 335 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,035 ppm (335 ppm + 700 ppm). Carbon monoxide (CO) ranged from 0.0 – 0.1 ppm.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	77.1	38.3	343	0.0
Drill Hall	76.6	38.3	366	0.0
Room 108A Lounge	73.4	42.8	394	0.0
Kitchen	72.8	43.5	370	0.0
Room 107	72.7	43.8	418	0.0
Room 104	72.5	44.0	427	0.0
Room 103	74.0	45.2	498	0.0
Room 102B	73.8	45.6	547	0.0
Recruit Office	74.2	46.0	757	0.0
Room 111 Converted Firing Range	**71.3**	45.1	353	0.1
Outdoors	76.8	40.5	327	0.0
Criteria	**73.0-79.0**	**30-60**	**<1,035**	**<9.0**

Key: **Bolded** results exceed listed criteria

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

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

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

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

1. There is a hole in the Supply Room ceiling from a previous water leak.

2. In Room 109 there were water stained ceiling tiles with possible fungal growth present. Efflorescence was observed on the walls.

3. A few water stained ceiling tile were observed throughout the building.

4. Supply and return vents were dirty throughout the building.

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

BEST AVAILABLE COPY

Section 7.0

Suspect Asbestos Containing Building Materials

BEST AVAILABLE COPY

Section 7.0 Suspect Asbestos Containing Building Materials

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

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

1. Black mastic was observed in the kitchen where vinyl floor tile have been removed. This is a non-friable suspect material and could present a concern if it is disturbed.

2. Black mastic was observed in the Drill Hall on the ceiling where ceiling panels were missing. This is a non-friable suspect material and could present a concern if it is disturbed.

BEST AVAILABLE COPY

Section 8.0
Maintenance Bay

BEST AVAILABLE COPY

Section 8.0 Maintenance Bay

There is no garage area at this facility.

BEST AVAILABLE COPY

Section 9.0
Limitations

Section 9.0 Limitations

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

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

BEST AVAILABLE COPY

Appendix A
Laboratory Analysis Report

BEST AVAILABLE COPY

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:**	Silver Spring (White Oak) Armory	**Chain Of Custody:**	508984
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Silver Spring, MD	**Date Submitted:**	10/12/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	10/19/2010
Attention:	[redacted]			**Report Date:**	10/22/2010
				Revision Number:	1
				Revised Date:	10/22/2010

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 (ft²)	Reporting Limit		Total ug	Final Result		Comments
1104395	1010665-1	Flame	Air	928	N/A	3.2	ug/m³	<3	<3.2	ug/m³	
1104396	1010665-2	Flame	Air	907	N/A	3.3	ug/m³	<3	<3.3	ug/m³	
1104397	1010665-3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1104398	1010665-4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104399	1010665-5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104400	1010665-6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104401	1010665-7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104402	1010665-8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104403	1010665-9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104404	1010665-10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104405	1010665-11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104406	1010665-12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104407	1010665-13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104408	1010665-14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104409	1010665-15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1104410	1010665-16	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

LAB #100470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Silver Spring (White Oak) Armory	**Chain Of Custody:**	508984		
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Silver Spring, MD	**Date Submitted:**	10/12/2010		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	10/19/2010	**Report Date:**	10/22/2010
Attention:	[redacted]			**Revision Number:**	1	**Revised Date:**	10/22/2010

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: [redacted]

Technical Manager: [redacted]

Page 1 of 2

QW3 (410) 247-2024 150202 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) **508984**

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) 942-0264

Submittal Information:
1. Job Name: Silver Spring (White Oak) Armory
2. Job Location: Silver Spring, MD
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Pers Non-Responsive [redacted] Non-Responsive [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: 10/19/10 ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ Include COC/Field Data Sheets with Report ☒ Email Non-Responsive [redacted] @analyticallab.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) 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	MICRO VAC	TAPE	SWAB
101010605-1	Drill Hall	10/7	928					X		X						
101010605-2	Rm 102		907					X		X						
101010605-3	Blank		0					X		X						
101010605-4	Drill Hall - Fl			100cm²				X				X				
101010605-5	Drill Hall - Tabletop							X				X				
101010605-6	Drill Hall - Kitchen Countertop							X				X				
101010605-7	*CFR - Top of Locker							X				X				
101010605-8	CFR - Fl							X				X				
101010605-9	CFR - AC Wall Unit Supply Grill							X				X				
101010605-10	Fl Outside CFR							X				X				
101010605-11	Rm 108A Window Sill							X				X				
101010605-12	Kitchen - Top of Refrigerator							X				X				

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

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 10 / 12 / 10 @ 1135 Via: Depot By (Print) Non-Responsive [redacted] Sign:
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ____ / ____ / ____ Time: ____ Initials: ____
4. Comments:

*CFR = Converted Firing Range

BEST AVAILABLE COPY

OVI (410) 247-2024   150202   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

Page 2 of 2

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 508984
p 2/2

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: Silver Spring (White Oak) Armory
2. Job Location:
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person: Shirley Chapman/Ken Forsythe @ phone #: (410) 942-0273
5. Submitted by: Signature:

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

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

Non-Responsive

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 Trap/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
1010665-13	Rm107 Supply Vault	10/1		100cm²				X				X				
1010665-14	Rm103-F1	↓		↓				X				X				
1010665-15	Rm103B [illegible] shelf	↓		↓				X				X				
1010665-16	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

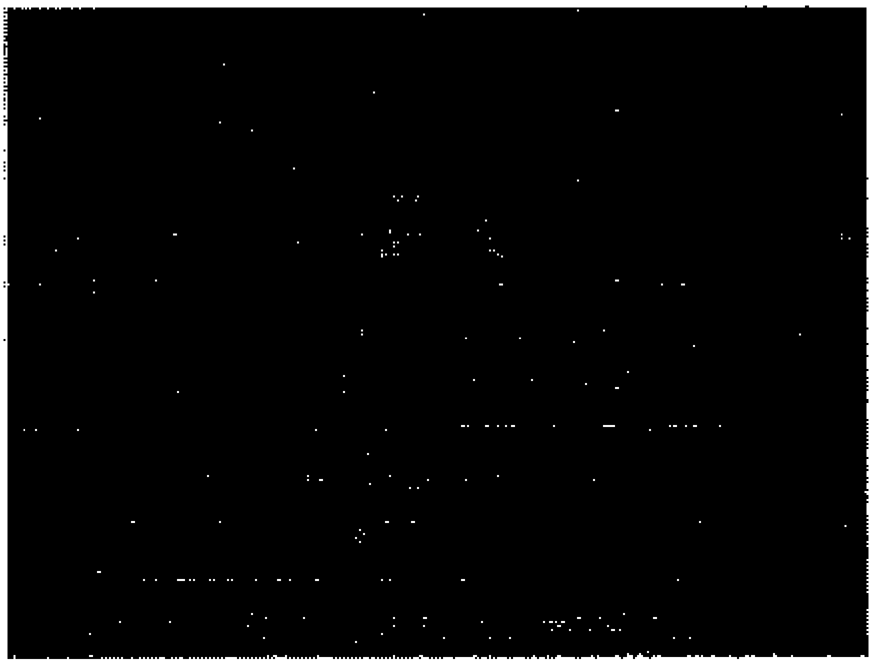
BEST AVAILABLE COPY

Exterior.

Drill Hall.

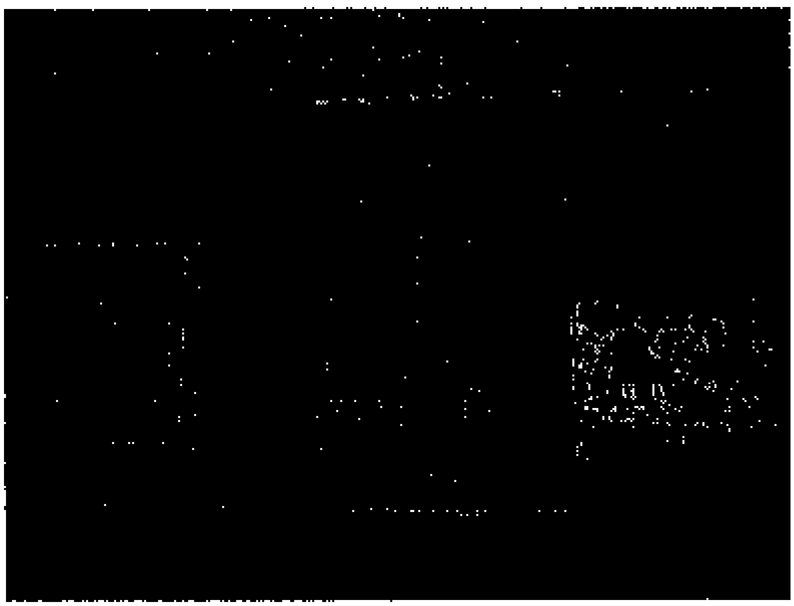
BEST AVAILABLE COPY

Drill hall ceiling, peeling paint.



Drill hall wall, possible asbestos containing mastic.

Converted firing range.

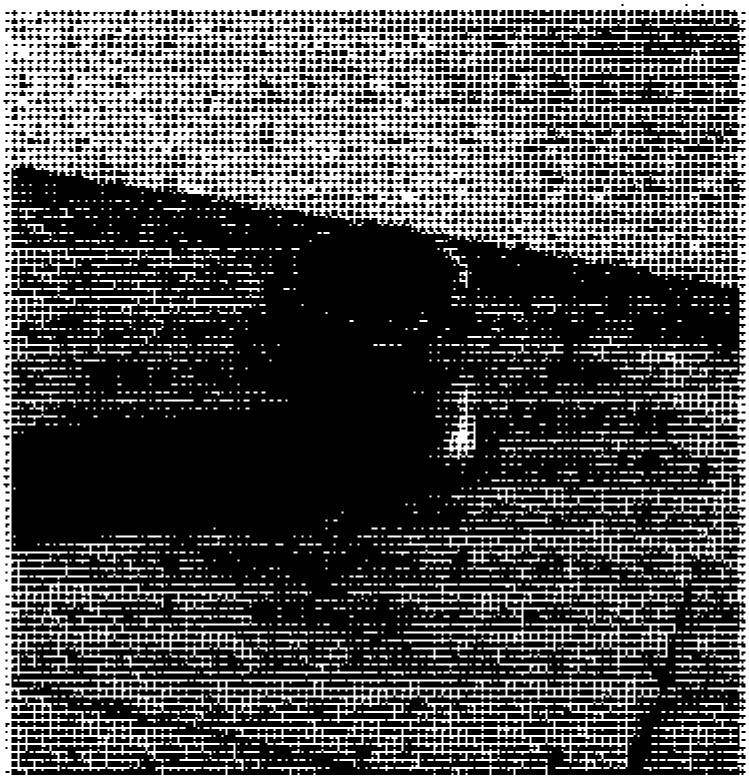


Room 109, exterior wall, visible fungal growth on ceiling tile.

Room 103, dirty supply diffuser.

Roof, fresh air intake area.

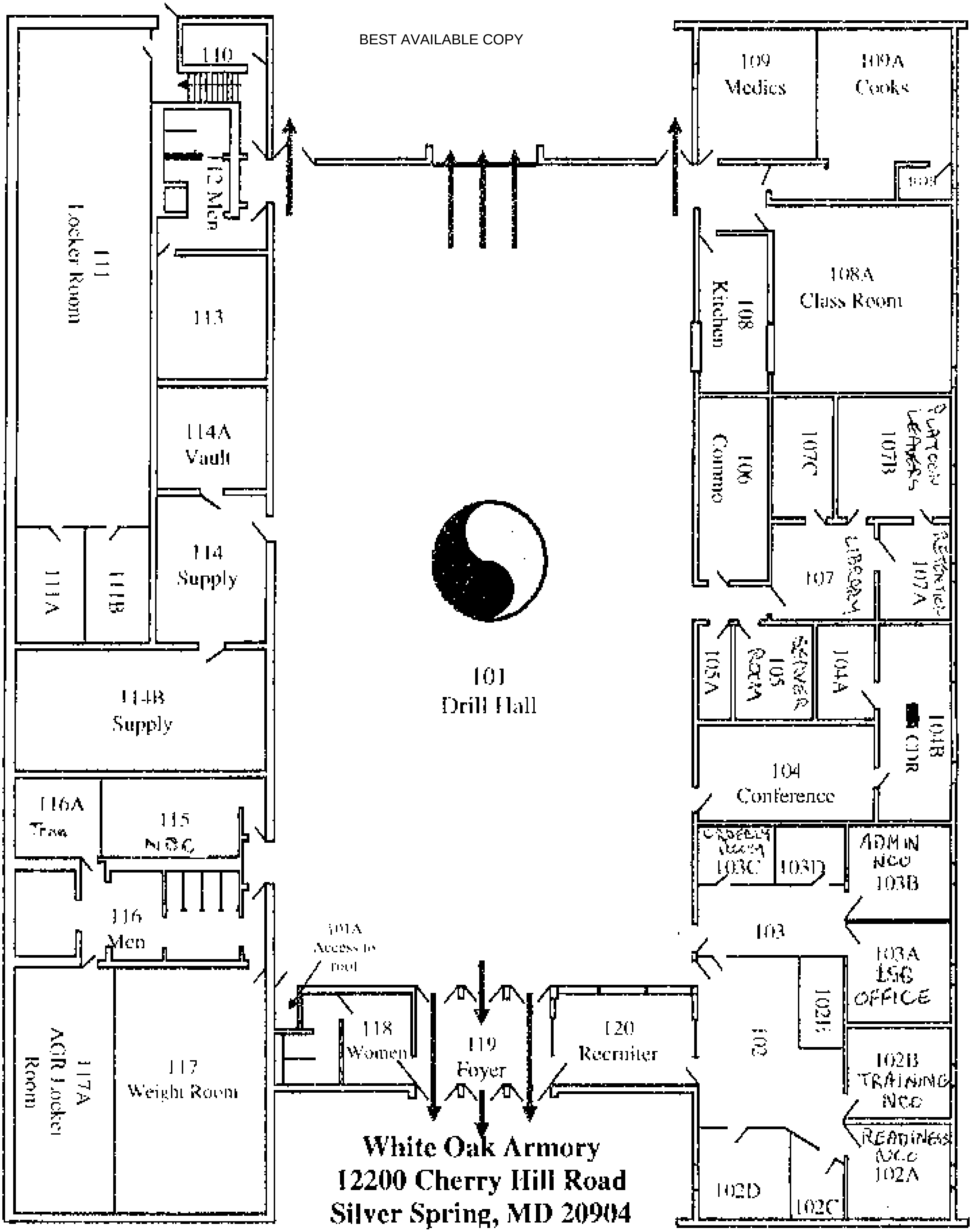
BEST AVAILABLE COPY



Steel vent pipe, possible lead around the pipe.

Appendix C
Floor Plan

BEST AVAILABLE COPY



White Oak Armory
12200 Cherry Hill Road
Silver Spring, MD 20904

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

BEST AVAILABLE COPY

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
Silver Spring Readiness Center

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Silver Spring Readiness Center** **1200 Cherry Hill Road** **Silver Spring, MD 20940**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**May 8, 2013**
Report Date:	**June 7, 2013**

Non-Responsive

[redacted]

Manager, Industrial Hygiene Services

Table of Contents

Section 1.0 Executive Summary

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

1. Surface, bulk and air samples for lead were collected. Surface samples were less than the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended guideline. Air samples were less than the Occupational Safety and Health Administration (OSHA) Action Level for lead. No lead based paint was found in the bulk sample of peeling paint analyzed for lead content. See Section 3.0 for detailed findings.

2. Lighting levels met the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in all locations tested. See Section 4.0 for detailed findings.

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

    a. Temperature levels were within the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guidelines of 68-79 °F in all locations.

    b. Relative humidity levels exceeded the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in all areas evaluated.

    c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 ppm.

    d. Carbon dioxide (CO_2) levels were less than the ASHRAE 62.1-2010 recommended ceiling for mechanically ventilated office buildings and commercial settings.

    See Section 5.0 for detailed findings.

4. Water-stained ceiling tiles, an active roof leak and dirty supply diffusers were observed in the facility. It was also reported the Heating Ventilating & Air-condition (HVAC) system only works in one portion of the building. See Section 5.0 for detailed findings.

5. Suspect asbestos containing material (ACM) was observed to be intact and in good condition. See Section 6.0 for detailed findings.

BEST AVAILABLE COPY

Section 2.0 Operation Description & Observations

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

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

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

There is no converted firing range at this facility.

There is no child-care facility in the building.

Overall housekeeping practices were adequate.

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

BEST AVAILABLE COPY

Section 3.0 Lead Testing

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

Lead Testing Results Summary

Sample #	Location	Bulk (%)	Air ug/m^3	Surface ug/ft^2
1	Drill Hall	*	<5.7	*
2	Locker Room	*	<5.7	*
3	Drill Hall - Floor	*	*	<110
4	Drill Hall – Top of AED Box	*	*	<110
5	Drill Hall – Top of Amnesty Box	*	*	<110
6	Kitchen – Top of Microwave	*	*	<110
7	Kitchen – Top of Ice Machine	*	*	<110
8	Hall way floor – Outside of Locker Room	*	*	<110
9	Locker Room – Floor	*	*	<110
10	Locker Room – Top of Locker	*	*	<110
11	Room 120 – Top of File Cabinet	*	*	<110
12	Office 102-B – Top of Bookshelf	*	*	<110
13	Office 103-D Ceiling Supply Diffuser	*	*	<110
14	Office 107-A – Top of Desk	*	*	<110
15	Room 108-A – Book Shelf	*	*	<110
16	Room 109-A – Storage Shelf	*	*	<110
17	Room 109-A Paint Chip	<0.0051%	*	*
18	Blank - Air	*	<3 ug	*
19	Blank - Wipe	*	*	<12 ug
-	Criteria	0.5	50	200

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2 =** micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Sources:

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

BEST AVAILABLE COPY

2. Occupational Safety and Health Administration (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. 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.

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

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

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

- A few areas of peeling paint were observed. A sample was collected from Room 109 (Sample #17) and determined not to be lead-based paint. However, all areas of peeling paint should be properly repaired.

BEST AVAILABLE COPY

Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. 98011EL). The light meter was last calibrated in November 2012. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Room 120	66.1	30-50	Yes
Room 102-A	46.0	30-50	Yes
Room 102-B	52.4	30-50	Yes
Room 102	74.4	30-50	Yes
Room 103-A	59.4	30-50	Yes
Room 103-B	106.2	30-50	Yes
Room 103	64.4	30-50	Yes
Drill Hall	64.8	10	Yes
Room 104	35.4	30-50	Yes
Room 104-B	47.3	30-50	Yes
Room 104-A	52.9	30-50	Yes
Room 107	77.3	30-50	Yes
Room 107-A	138.4	30-50	Yes
Room 107-B	96.2	30-50	Yes
Kitchen	51.0	50	Yes
Room 108-A	54.8	30-50	Yes
Room 109-A	105.3	30-50	Yes
Room 109	44.8	30-50	Yes
Locker Room	143.6	7	Yes
Fitness Center	35.8	30	Yes

Table Notes:

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

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

The lighting levels measured met the minimum recommended guideline in all areas tested.

BEST AVAILABLE COPY

Section 5.0 Indoor Air Quality

Survey measurements were made for comfort parameters and ventilation (temperature, relative humidity, carbon dioxide, and carbon monoxide). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7575-X (Serial #1228008). The IAQ Meter was last calibrated in July 2012.

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

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Fitness Center	72.5	**65.6**	753	0.0
Room 120	71.9	**61.7**	590	0.0
Room 103-B	70.3	**62.2**	628	0.0
Outdoors	72.1	53.1	364	0.0
Criteria	**68-79**	**30-60**	**<1,064**	**<9**

Table Notes:
1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **°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 recommended guidelines in all areas tested.

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

- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level at the time of the survey. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,064 ppm. This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide.

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

    - There was an active roof leak in Rooms 109 and 109-A. The water infiltration is causing efflorescence and peeling paint on the exterior walls in these rooms. It is also causing the floor tiles in room 109-A to become separate from the floor.

    - Dirty ceiling supply diffusers were observed in the facility.

    - Some water damaged ceiling tiles were observed in several locations in the facility.

BEST AVAILABLE COPY

Section 6.0 Suspect Asbestos Containing Building Materials

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

1. Black mastic dots on the walls and ceiling of the drill hall.

2. Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

BEST AVAILABLE COPY

Section 7.0 Equipment

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

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98011EL	11/2012	NA
SKC Air Sampling Pump	767926	5/8/13	2.50 LPM
SKC Air Sampling Pump	647598	5/8/13	2.50 LPM

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

Appendix A. Laboratory Analysis Report

BEST AVAILABLE COPY

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:**	Maryland	**Chain Of Custody:**	515869
Address:	301-III Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Silver Spring 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:**	5/21/2013 **Report Date:** 5/21/2013
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
13061754	1	Flame	Air	525	N/A	5.7	ug/m³	<3	<5.7	ug/m³	
13061755	2	Flame	Air	525	N/A	5.7	ug/m³	<3	<5.7	ug/m³	
13061756	3	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061757	4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061758	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061759	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061760	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061761	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061762	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061763	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061764	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061765	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061766	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061767	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061768	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061769	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13061770	17	Flame	Paint Chip	****	N/A	0.0051	%Pb		<0.0051	%Pb	
13061771	18	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13061772	19	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

BEST AVAILABLE COPY

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:**	515869
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Silver Spring 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:**	5/21/2013 **Report Date:** 5/21/2013
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.

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

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.

Analys[redacted]

Technical Manag[redacted]

An AIHA (#100470) and NELAP Accredited Laboratory
4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

BEST AVAILABLE COPY

BEST AVAILABLE COPY

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) S15869 (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: ~~Maryly~~ Maryland
2. Job Location: Silver Spring RC
3. Job #: [redacted]: W912K6-09-A-0003
4. Contact Pe[redacted] @ phone # (410) 942-0273
5. Submitted [redacted]nature: [redacted]

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

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

NORMAL BUSINESS HOURS
~~☒ Immediate~~ (MJM)
☐ Next Day
☐ 2 Day
☐ 3 Day
☒ 5 Day + Date Due: 5/21/13
☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

REPORT TO:
☒ Inclu[redacted]ith Report
☒ Ema[redacted] Complianceplace.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 1 (QTY)
☒ Pb Dust Wipe (wipe type Ghost) ~~15~~ 15 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

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

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1	Drill Hall	5-8	~~375~~	525				X								
2	Locker Room		~~375~~	525				X								
3	Drill Hall floor			100 cm²				X								
4	Drill Hall AED Box							X								
5	Drill Hall Amnesty Box							X								
6	Kitchen Microwave							X								
7	Kitchen Ice Machine							X								
8	Floor outside locker Room							X								
9	Locker Room floor							X								
10	Locker Room - Locker							X								
11	Rm. 120 file Cabinet							X								
12	Rm. 102-13 - Book shelf							X								

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
TAT Change to comply w/ 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): MJM Sign:
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ____ / ____ / ____ Time: ____ Initials: ____
4. Comments: 7945 0135 1790

BEST AVAILABLE COPY

BEST AVAILABLE COPY

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

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 515869 (page 2 of 2)

Mailing/Billing Information:
1. Client Name: National Guard Bureau
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: Silver Spring RC
3. Job #: [redacted] P.O. #: W912K6-09-A-0003
4. Contact Person [redacted] @ [redacted] 273
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 ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate) ☐ Next Day ☐ 5 Day + ☐ 2 Day Date Due: ___	☒ 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__(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 Rm 103-P	Supply Office	5-8		100 cm²				X								
14 Rm. 107-A	Desk	↓		↓				X								
15 Rm 108-A	Book Shelf							X								
16 Rm 109-A	- ~~Paint Chip~~							X								
17 Rm 108-A	- Paint Chip							X			X					
18 Blank - Air			0	0												
19 Blank - Wipe		↓														

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

Appendix B. Photographs

BEST AVAILABLE COPY

Exterior of facility

Drill hall

Drill hall ceiling peeling paint

Room 109-A Peeling paint on exterior wall

BEST AVAILABLE COPY

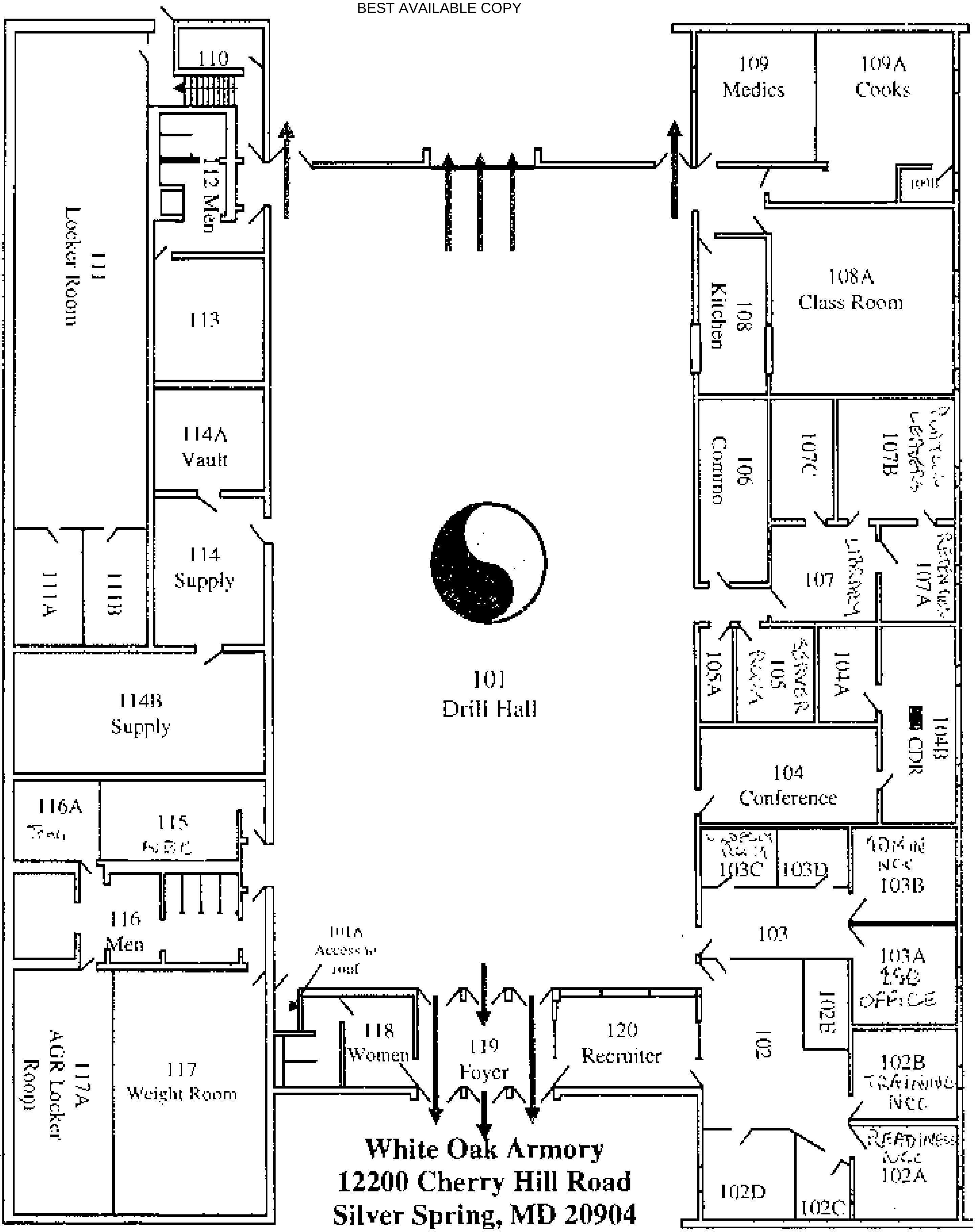
Water stained ceiling tiles in the facility

Dirty supply diffusers in the facility

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

Appendix C. Floor Plan

BEST AVAILABLE COPY



White Oak Armory
12200 Cherry Hill Road
Silver Spring, MD 20904

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.

BEST AVAILABLE COPY

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

30 SEPTEMBER 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, Towson (Old) Armory, Towson, MD, Project No. 55-ML-01ED-03/05

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

2. The project number for this service reflects the current fiscal year of dispatch and the actual field work which was completed for fiscal year 2003. The State of Maryland Army National Guard occupational health nurse was immediately notified in writing of findings necessitating immediate corrective action in Maryland armories. In addition, the National Guard Bureau Region North Industrial Hygiene Office has been notified of all the results of lead in dust sampling conducted in all facilities. Draft reports were reviewed by you or other members of the National Guard and members of this Center, including our editorial staff, during drafting stages in report preparation leading up to the final report.

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

FOR THE COMMANDER:

[redacted]

Encl

Director, Occupational Health Sciences

Readiness thru Health

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

USACHPPM

CONSERVARE SALUTEM

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

Approved for public release; distribution unlimited

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

Readiness Thru Health

BEST AVAILABLE COPY

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)*

BEST AVAILABLE COPY

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

MCHB-TS-OFS

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

1. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard facilities to identify and measure the existence and extent of potentially hazardous operations or conditions. This survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee for the Defense Occupational and Environmental Health Readiness System.

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. Deteriorated lead-based paint (LBP) was found throughout the facility. Falling paint is likely to contribute to the levels of lead in dust, and will continue to deteriorate unless it is stabilized. Deteriorated LBP can be potentially hazardous to children if contacted.

d. Asbestos. Some pipe insulation in the classroom that is presumed to be asbestos-containing material (ACM) was exposed. If it is determined to be asbestos it must be encapsulated or removed as soon as possible. There were also presumed asbestos vinyl floor tiles in the armory. The tiles are intact; however, if they are damaged in the future, the tiles may become friable and asbestos fibers may be released. There was no Asbestos Management Plan (AMP) for the facility.

Readiness thru Health

e. Safety. Equipment in the Supply Storage Room posed a potential tripping hazard, and a potential for injury from falling materials.

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

a. Lead Exposure. Health RAC 3 for adults. Health RAC 2 for children.

(1) Develop and implement a written Lead Hazard Management Plan for Towson Armory. Ensure that the armory is in compliance with the OSHA Lead Standard, Title 29 Code of Federal Regulations (CFR), Parts1910.1025, and the OSHA Lead in Construction Standard, Title 29 CFR Part 1926.62.

(2) Repair and stabilize deteriorated paint.

(3) Discontinue advertising and hosting events that include children in the armory until cleanup is completed. Clean horizontal surfaces in the Drill Hall to the Environmental Protection Agency, and State of Maryland lead in dust standard for children. Clean horizontal surfaces in the administrative areas to the National Guard Bureau (NGB) Region North and U.S. Army Center for Health Promotion and Preventive Medicine decontamination levels.

(4) Clean all areas where sampling results showed elevated levels of lead. At a minimum, if only adults use this facility, clean to the recommended safe levels for adults. Follow the comprehensive guidelines for cleaning in Appendix E. Follow the decontamination requirements for the indoor firing range (IFR) provided in the Addendum to NGB All States Letter P01-0075. Consult with the Maryland Armory Environmental Coordinator concerning disposal requirements after cleanup.

(5) Pending cleanup, restrict access to the former IFR by keeping it locked. Post a sign warning against use of the room except in an emergency. Ensure that personnel wear disposable gloves and disposable coveralls to prevent tracking lead out when working in the former IFR.

b. Asbestos Exposure. Health RAC 3 if asbestos is present.

BEST AVAILABLE COPY

(1) Review armory and the Maryland NGB office records to determine whether there are asbestos records for inspection and abatement, or if there is an AMP for Towson Armory.

(2) If records cannot be located, sample the exposed pipe insulation and vinyl floor tiles to determine whether they are ACM.

(3) If they are determined to be asbestos and become damaged, encapsulate or remove them as soon as possible.

(4) If asbestos is identified, develop and implement an AMP if there is not one for the armory. Army policy requires an AMP for all asbestos in the facility, and to take immediate corrective action where a possible asbestos hazard has been identified.

c. Safety Hazards. RAC 4. Reorganize the equipment in the Supply Storage Room. There was a danger of people tripping on the equipment and supplies, and the potential for items to fall onto people entering the room.

BEST AVAILABLE COPY

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

TABLE OF CONTENTS

Paragraph Page

Appendices

Table

BEST AVAILABLE COPY

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
TOWSON (OLD) ARMORY
TOWSON, MD
PROJECT NO. 55-ML-01ED-03/05
10 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. Electronic mail: MDARNG, Ms. [redacted], 28 February 2003, subject: SAB.

4. BACKGROUND INFORMATION.

a. Armory Mission. Towson (Old) Armory is the home of the 290 th Military Police Company Guard.

b. Date of Construction. The approximate date of construction was 1932.

c. Armory Use by Children: The point of contact stated that the armory was occupied by children throughout the year. Events included after school basketball practice, sponsored activities for children on drill weekends, and additional activities for children approximately three times per year. The Maryland Military Department is currently advertising Towson Armory as available for rental for activities that may include young children.

d. Points of Contact. Manager: SFC [redacted], Towson (Old) Armory, 307 Washington Avenue, Towson, MD 21204-4765

Readiness thru Health

5. PHOTOGRAPHS. See Appendix B.

6. FACILITY EVALUATION.

a. Sampling Locations and Results. Samples were collected for lead in air, on surfaces (wipe samples) and in bulk paint to determine the presence of lead hazards. Sample results are shown in the Table and in Appendix C.

b. Physical Condition of facilities.

(1) General. The facility appeared to be in good condition. No mold or moisture source capable of supporting mold was observed.

(2) Paint. There was deteriorated paint throughout the armory. The age of the building indicated that the presence of lead-based paint (LBP) was likely. The radiators had areas of deteriorated paint at the time of the survey, but it was reported that they were repainted in 2001 with non-LBP. SSG [redacted], Environmental Compliance Assessment Coordinator for the MDNGB stated that there were no records of any lead abatement for this facility.

(3) Asbestos. We informed SSG [redacted] that there was exposed presumed asbestos-containing material (ACM) in some pipes in the classroom. SSG [redacted] stated that the National Guard Bureau (NGB) had abated some asbestos in the armory, and further abatement was planned. There were also intact presumed asbestos tiles throughout the armory. A site Asbestos Management Plan (AMP) was not located in the armory.

c. Safety Hazards. Equipment in the Supply Storage Room was disorganized (Photograph number 0833, Appendix B) and posed a potential tripping hazard, and a potential for injury from falling items.

d. Indoor Firing Range. The indoor firing range (IFR) had been converted to the Supply Storage Room. There were no records found of cleaning or lead abatement in the IFR.

e. Safety and Occupational Health Programs. There was no written Lead Hazard Management Plan (LHMP) or AMP in the facility. There was no written Hazard Communication (HAZCOM) Program. The Occupational Safety and Health Administration (OSHA) requires employers to provide information to their employees concerning hazardous chemicals to which they are exposed. This is accomplished by establishing a HAZCOM Program for armory employees. Program elements include the use of labels and other forms of warning, Material Safety Data Sheets, and information and training addressing protective measures for employees.

f. Heating, Ventilation, and Air-Conditioning Systems. The building was centrally heated by steam baseboard radiators. Some areas of the building had window air-conditioning units. There were no reported or observed problems with the ventilation.

g. Noise Dosimetry. No operations with the potential to generate hazardous noise levels were identified.

h. Lighting. All areas of the armory were visually judged to be adequately lit.

7. ASSESSMENT CRITERIA FOR LEAD. See Appendix D for details.

a. Lead in Air. The Army complies with the OSHA 8-hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter ($\mu g/m^3$) 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% or more by weight in dried solid (also reported as 5000 milligrams per kilogram) is considered to be LBP according to EPA and Maryland State regulations. Paint containing lead levels of more than 0.7 milligrams per square centimeter is considered to be LBP according to Maryland State Regulations. In Army Regulation 420-70, Buildings and Structures, lead-contaminated paint (LCP) is defined as any paint containing detectable amounts of lead. The Army considers LCP to be potentially hazardous to children if it is disturbed or deteriorating.

d. Lead Carcinogenicity. In February 2005, the Department of Health and Human Services National Toxicology Program (NTP) released the Report on Carcinogens, Eleventh Edition. The NTP report lists "lead and lead compounds" as "reasonably anticipated to be human carcinogens".

8. SAMPLING RESULTS, DISCUSSION, AND CONCLUSIONS.

a. Lead.

BEST AVAILABLE COPY

(1) Lead in Air. General area lead in air sampling was conducted throughout the armory. All air samples were below the OSHA standard for lead in air. There was no overexposure to personnel from lead in air in this building.

(2) Lead in Dust. Lead in dust wipe sample locations and analytical results are shown in the Table below. Levels of lead in dust that exceeded safe limits for children and adults were found in two rooms in the armory. These levels may result in health hazards to employees and to children visiting the armory. Extremely high levels of lead were found on the floor of the former IFR (2693 $\mu g/ft^2$). Personnel working in the former IFR are potentially exposed to lead in dust, and are tracking lead out of the area and redistributing it into adjacent rooms in the armory. This can result in lead exposures for children and for the general workforce.

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

Wipe Sample #	**Locations of Samples**	**Conc. ($\mu g/ft^2$)**
TOW01	Assembly Hall Floor Entrance	[redacted]
TOW02	Assembly Hall Floor by Fire Extinguisher	<23
TOW03	Assembly Hall Floor Center	<23
TOW04	Kitchen Counter	<23
TOW05	Room 209 Floor	[redacted]
TOW06	Room 209 Window Sill	[redacted]
TOW07	Former Firing Range/ Supply Room	[redacted]
TOW08	Classroom Floor	[redacted]
TOW09	Classroom Window Sill	[redacted]
TOW10	Air Conditioner Filter	<23

(3) Lead in Paint. Deteriorated LBP was found throughout the facility. Falling paint is likely to contribute to the levels of lead in dust, and will continue to deteriorate unless it is stabilized. Deteriorated LBP can be potentially hazardous to children if contacted.

b. Asbestos Exposure. Some pipe insulation in the classroom that was presumed to be ACM was exposed. If exposed insulation is determined to be asbestos it must be encapsulated or removed as soon as possible. There were also presumed asbestos vinyl floor tiles in the armory. The tiles are intact; however, if they are asbestos and they are damaged in the future, they may become friable and asbestos fibers may be released.

BEST AVAILABLE COPY

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

a. Lead Exposure. Health RAC 3 for adults. Health RAC 2 for children.

(1) Develop and implement a written LHMP for Towson Armory. Ensure that the armory is in compliance with the OSHA Lead Standard, Title 29 Code of Federal Regulations (CFR), Parts 1910.1025, and the OSHA Lead in Construction Standard, Title 29 CFR Part 1926.62.

(2) Repair and stabilize deteriorated paint.

(3) Discontinue advertising and hosting events that include children in the armory until cleanup is completed. Clean horizontal surfaces in the Drill Hall to the EPA and State of Maryland lead in dust standard for children. Clean horizontal surfaces in the administrative areas to the NGB Region North and USACHPPM decontamination levels.

(4) Clean all areas where sampling results showed elevated levels of lead. At a minimum, if only adults use this facility, clean to the recommended safe levels for adults. Follow the comprehensive guidelines for cleaning in Appendix E. Follow the decontamination requirements for the IFR provided in the Addendum to NGB All States Letter P01-0075. Consult with the Maryland Armory Environmental Coordinator concerning disposal requirements after cleanup.

(5) Pending cleanup, restrict access to the former IFR by keeping it locked. Post a sign warning against use of the room except in an emergency. Ensure that personnel wear disposable gloves, disposable coveralls, and booties to prevent tracking lead to other areas of the armory when working in the former IFR.

b. Asbestos Exposure. Health RAC 3 if asbestos is present.

(1) Review armory and the MDNGB office records to determine whether there are asbestos records for inspection and abatement, or if there is an AMP for Towson Armory.

BEST AVAILABLE COPY

(2) If records cannot be located, sample the exposed pipe insulation and vinyl floor tiles to determine whether they are ACM.

(3) If they are determined to be asbestos and become damaged, encapsulate or remove them as soon as possible.

(4) If asbestos is identified, develop and implement an AMP if there is not one for the armory. Army policy requires an AMP for all asbestos in the facility, and to take immediate corrective action where a possible asbestos hazard has been identified.

c. Safety Hazards. RAC 4. Reorganize the equipment in the Supply Storage Room. There was a danger of people tripping on the equipment and supplies, and the potential for items to fall onto people entering the room.

d. Safety and Occupational Health Programs/Hazardous Materials Management. Health RAC 3. Develop and implement a written HAZCOM Program for the facility. Maintain records for HAZCOM training and store them in an accessible area.

10. ADDITIONAL ASSISTANCE. For additional assistance or questions concerning this report, please contact the undersigned at DSN 584-5475/3118, commercial (410) 436-5475/3118, or electronic mail: [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. 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. AR 420-70, Buildings and Structures, 10 October, 1997. http://usachppm.apgea.army.mil/ihfs/LeadList.aspx

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

8. Illuminating Engineering Society of North America, ANSI/IESNA RP-1-1993, American National Standard Practice for Office Lighting, ANSI/IES RP-1-1993.

9. U.S. Environmental Protection Agency, Lead in Paint, Dust, and Soil. 1 February 2003. http://www.epa.gov/lead/

10. Maryland State Department of the Environment, Lead Poisoning Prevention Program/ Lead Enforcement Division, COMAR 26.02.07.12 Procedures for Determining Compliance. http://www.dsd.state.md.us/comar/26/26.02.07.12.htm

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

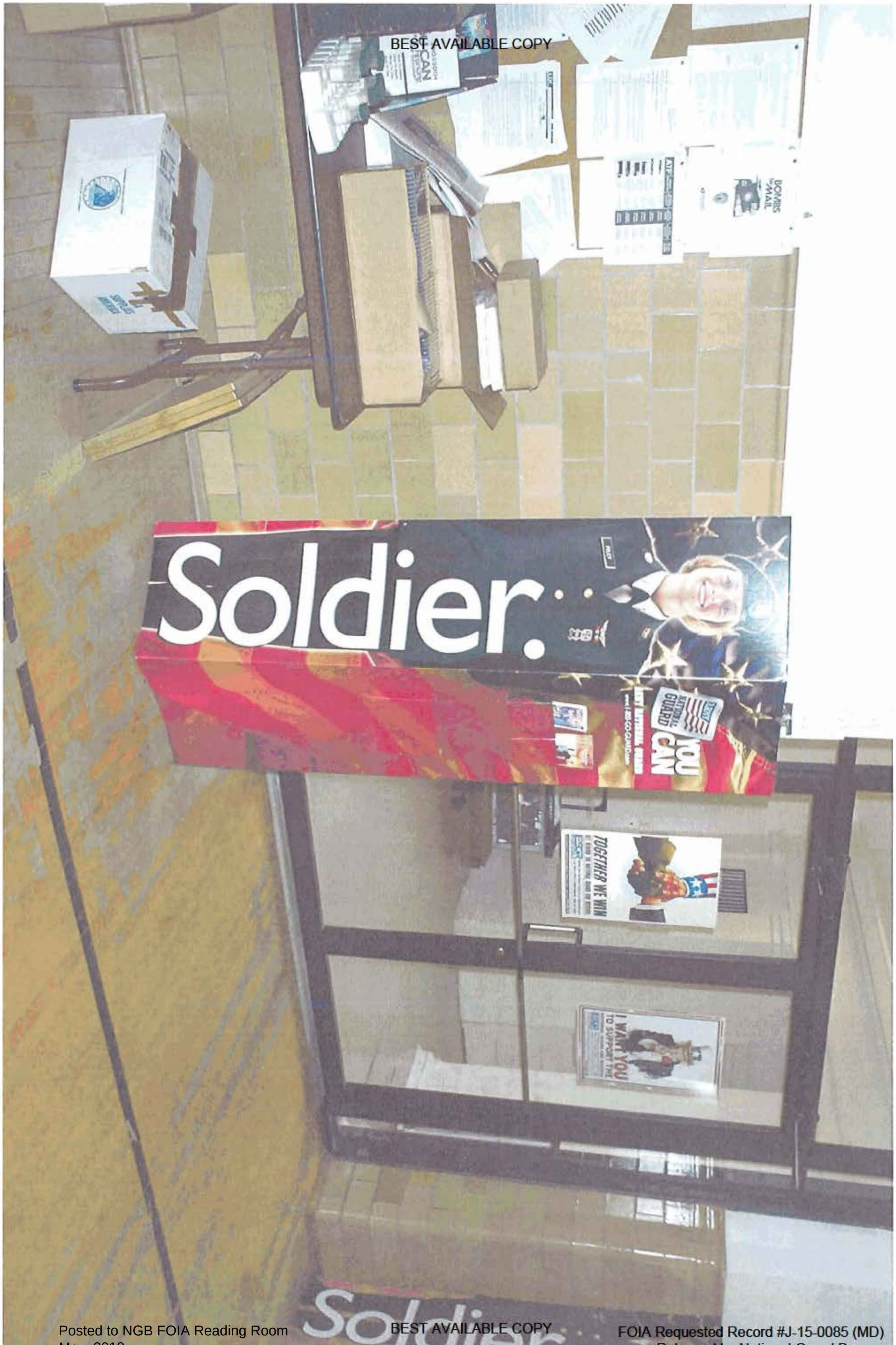
APPENDIX B

PHOTOGRAPHS

BEST AVAILABLE COPY

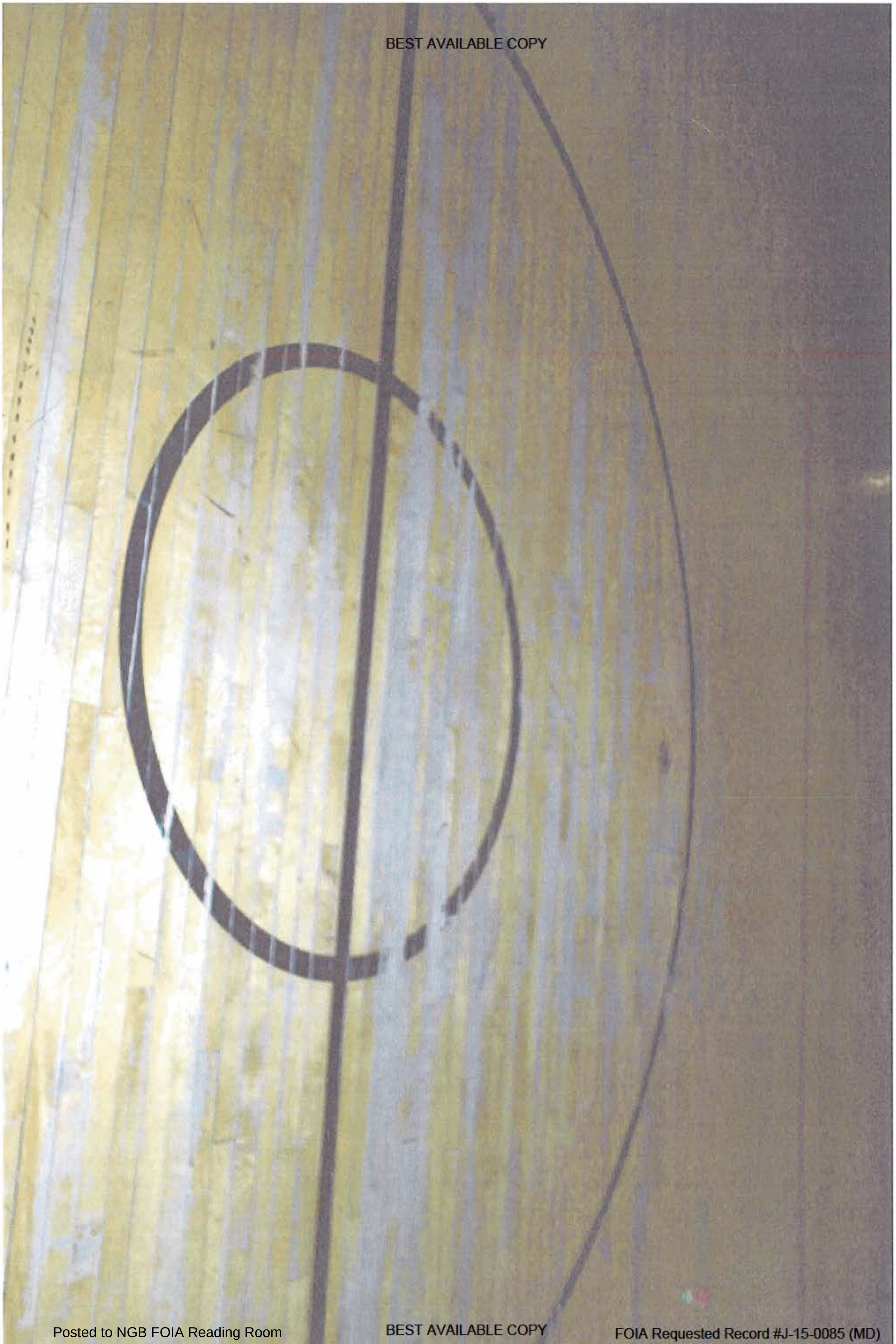
Towson (Old) Armory MD Photographs

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



BEST AVAILABLE COPY

BEST AVAILABLE COPY



BEST AVAILABLE COPY

DCP_0828.JPG Unknown

BEST AVAILABLE COPY

DCP_0829.JPG Unknown

BEST AVAILABLE COPY

DCP_0830.JPG Unknown

BEST AVAILABLE COPY

DCP_0831.JPG Unknown

BEST AVAILABLE COPY

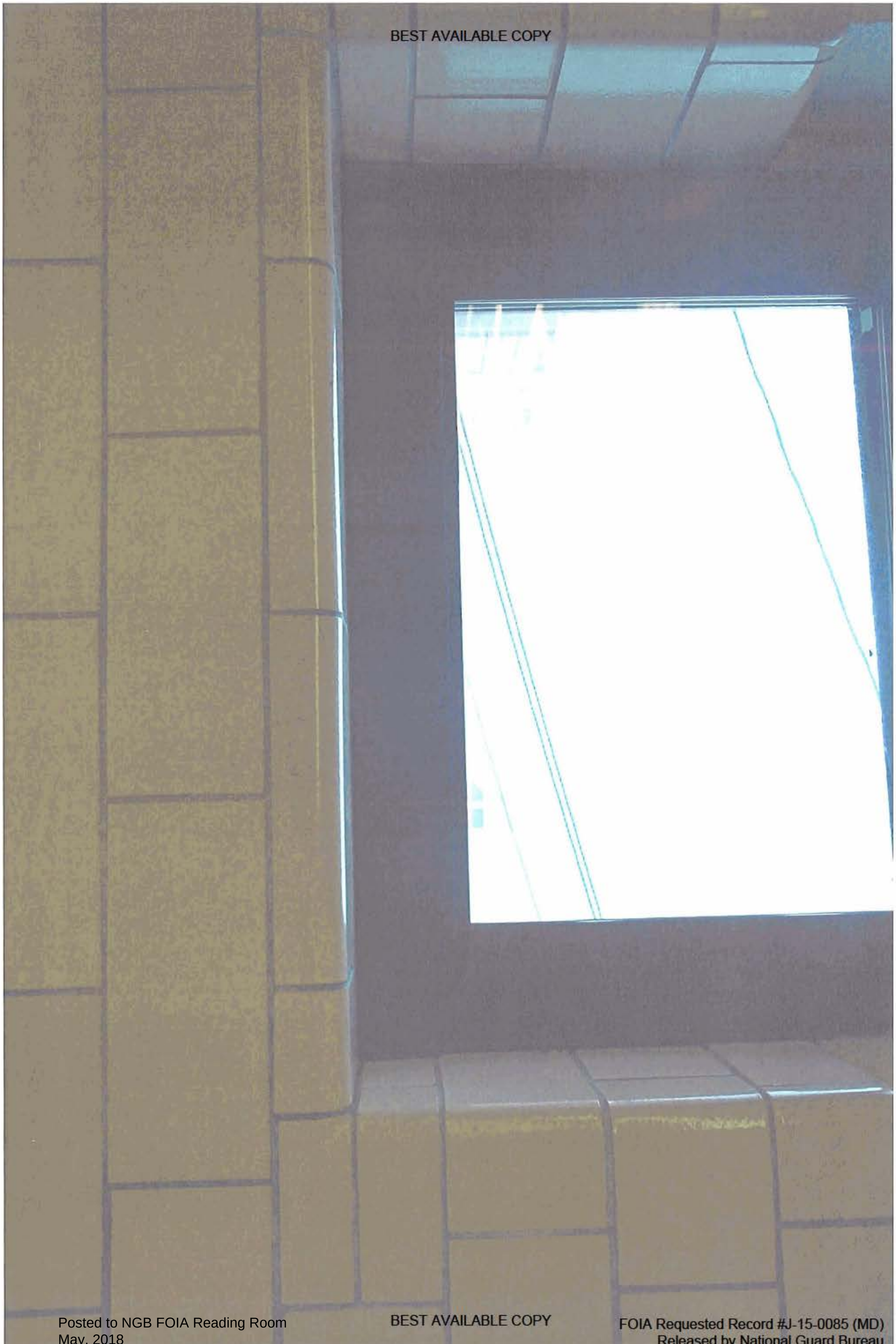
DCP_0832.JPG Unknown

BEST AVAILABLE COPY

BEST AVAILABLE COPY

BEST AVAILABLE COPY

DCP_0834.JPG Unknown



DCP_0836.JPG Unknown

APPENDIX C

SAMPLING LOCATIONS AND RESULTS

BEST AVAILABLE COPY

TEST REPORT
Page 1 of 2
7/23/03

DATA CHEM LABORATORIES, INC.

Submitted To: [redacted]
NGB, Army National Guard
Region IH North; ATTN: NGB-AVS-S1; 301 Old Bay Ln.
Havre de Grace, MD 21078-4094

Reference Data:	**Lead**
Client Sample No.:	TOAir1 through TOBlank2
P.O. No.:	VISA
Sample Location:	Towson (Old) Armory
Sample Type:	Filter
Method Reference:	NIOSH 7300
DCL Set ID No.:	03-S-3475
DCL Sample ID No.:	03-21664 through 03-21667
Sample Receipt Date:	7/18/2003
Preparation Date:	7/18/2003
Analysis Date:	7/21/2003

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

The sample condition upon receipt was acceptable except where noted.

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

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

[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/m³
TOAir1	03-21664	366.	ND	<0.0055
TOAir2	03-21665	368.	ND	<0.0054
TOBlank1	03-21666	-	ND	-
TOBlank2	03-21667	-	ND	-
	Prep Blank		ND	
% Recovery	LCS		104.	
RPL			2.0	

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

Non-Responsive [redacted]
Analyst

Non-Responsive [redacted]
Reviewer

RESERVOIRS ENVIRONMENTAL, INC.

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

TABLE I. ANALYSIS: LEAD BY WIPE SAMPLING

RES Job Number:	**RES 95429-1**
Client:	**USACHPPM**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**None Given**
Date Samples Received:	**July 15, 2003**
Analysis Type:	**USEPA SW846 3050B / AA(7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**July 17, 2003**

Client ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
TOW Blank 1	EM 794895	0.11	BDL	23	BDL
TOW 1	EM 794896	0.11	BDL	23	BDL
TOW 2	EM 794897	0.11	BDL	23	BDL
TOW 3	EM 794898	0.11	BDL	23	BDL
TOW 4	EM 794899	0.11	BDL	23	BDL
TOW 5	EM 794900	0.11	4.5	23	41
TOW Blank 2	EM 794901	0.11	BDL	23	BDL
TOW 6	EM 794902	0.11	BDL	23	BDL
TOW 7	EM 794903	0.11	294.0	23	2673
TOW 8	EM 794904	0.11	BDL	23	BDL
TOW 9	EM 794905	0.11	BDL	23	BDL
TOW 10	EM 794906	0.11	BDL	23	BDL
TOW Blank 3	EM 794907	0.11	BDL	23	BDL

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

BDL = Below Detection Limit

Data Qa

RESERVOIRS ENVIRONMENTAL, INC.

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

TABLE I. ANALYSIS: LEAD IN PAINT

RES Job Number:	**RES 95429-2**
Client:	**USACHPPM**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**None Given**
Date Samples Received:	**July 15, 2003**
Analysis Type:	**USEPA SW846 3050B / AA (7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**July 22, 2003**

Client ID Number	Lab ID Number	Detection Limit (%)	LEAD CONCENTRATION (%)
TOBU 1	EM 794908	0.005	1.972

BDL = Below Detection Limit

Data Qa

APPENDIX D

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE

ASSESSMENTS CRITERIA FOR LEAD

BEST AVAILABLE COPY

APPENDIX D

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE

ASSESSMENTS CRITERIA FOR LEAD

BEST AVAILABLE COPY

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

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

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

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

c. OSHA cites a level of 200 $\mu g/ft^2$ in CPL 2-2.58 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

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

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

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

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

APPENDIX E

LEAD CLEANING GUIDANCE

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

BEST AVAILABLE COPY

Chapter 14: Cleaning

I. Introduction

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

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

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

A. Performance Standard

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

B. Small Dust Particles

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

C. Difficulties in Cleaning

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

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

1. Low Clearance Standards

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

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

- 100 µg/ft^2 on floors.
- 500 µg/ft^2 on interior window sills (stools).
- 800 µg/ft^2 on window troughs (the area where the sash sits when closed).
- 800 µg/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.

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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.

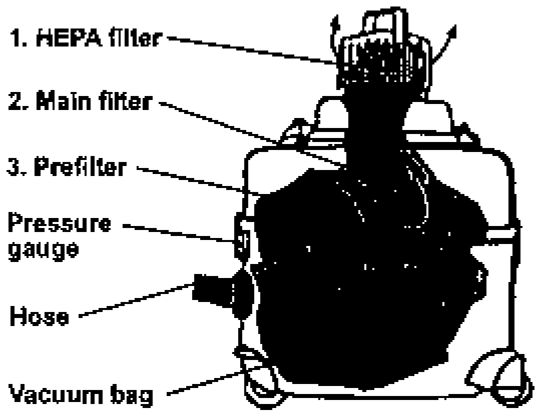
To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture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

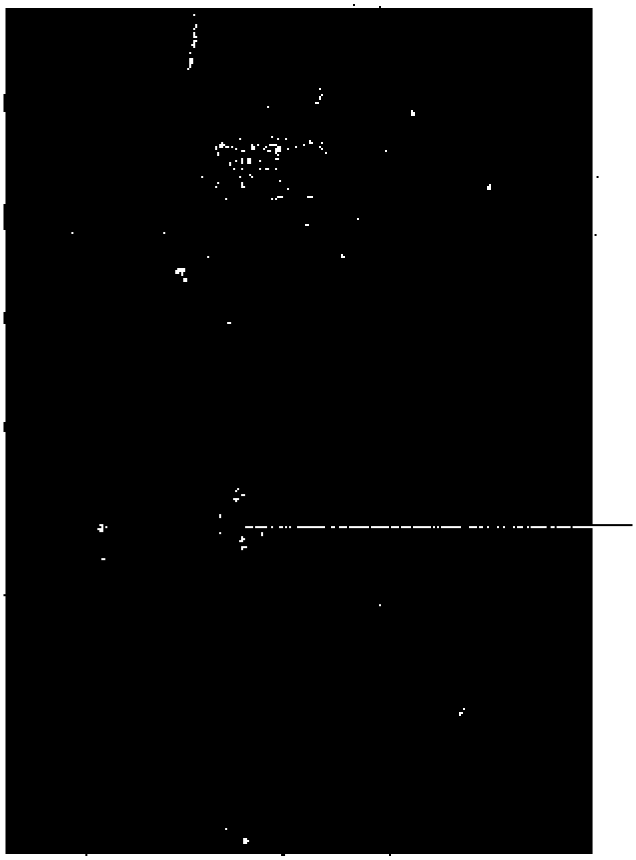
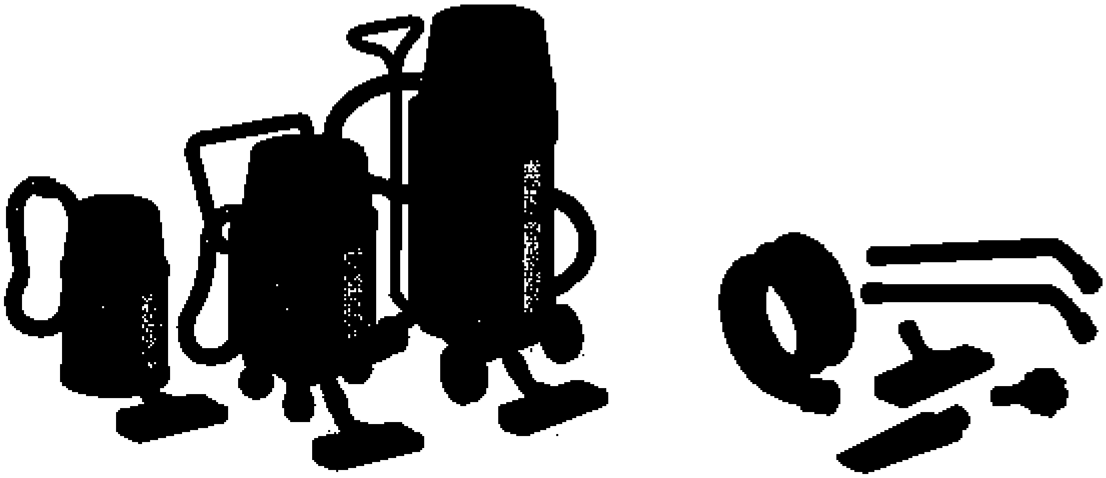


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

BEST AVAILABLE COPY

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

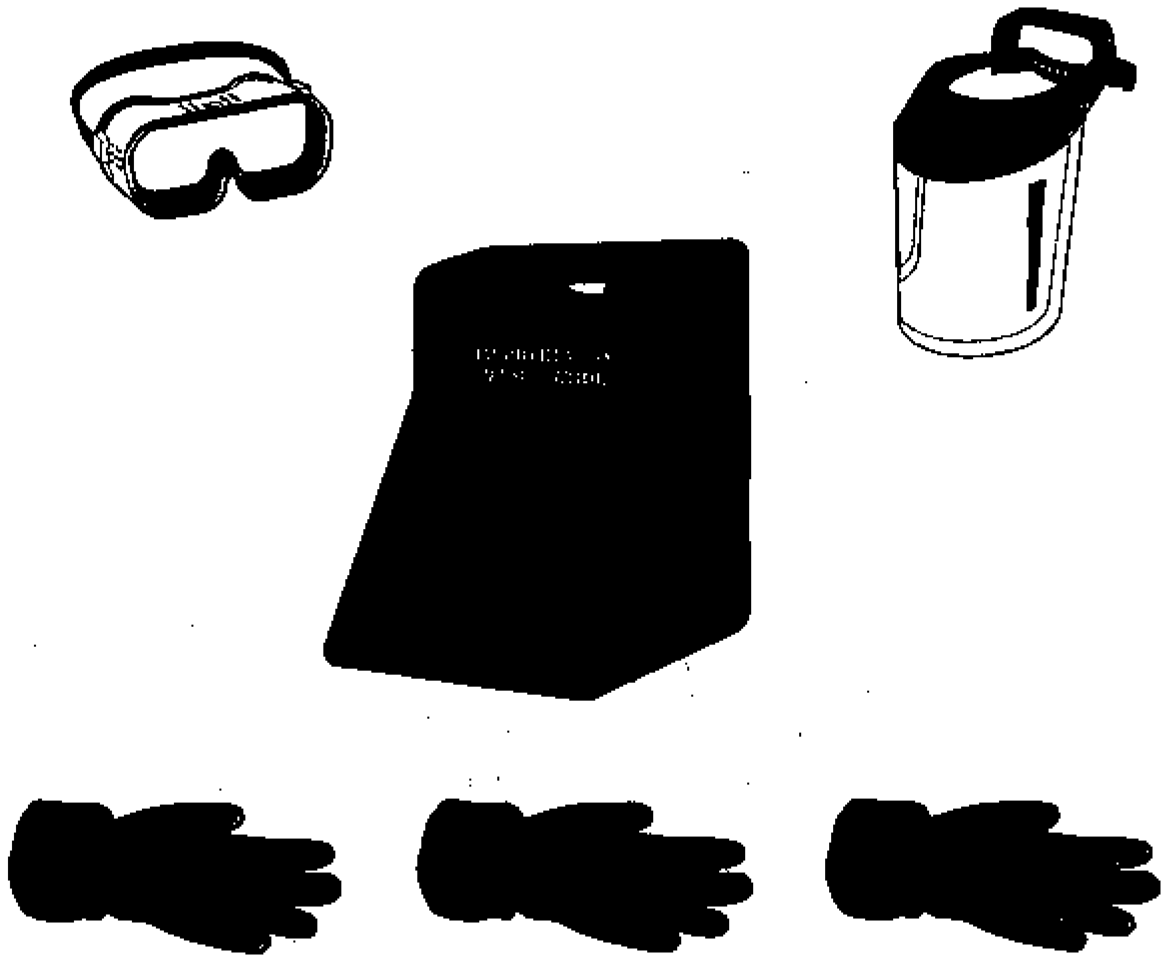
At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing 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

BEST AVAILABLE COPY

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

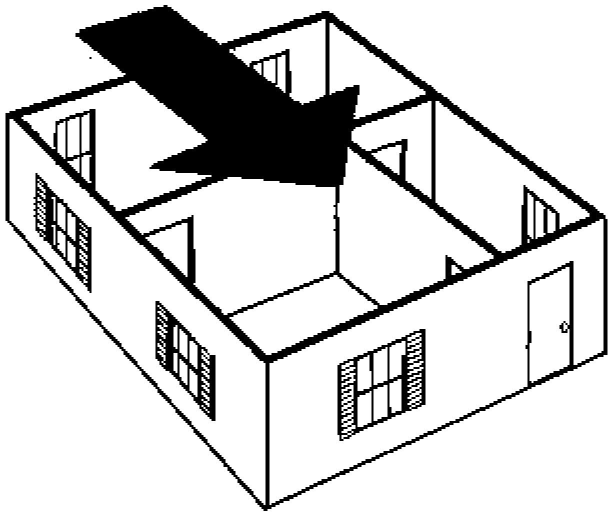
The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

- First, the area is HEPA vacuumed.

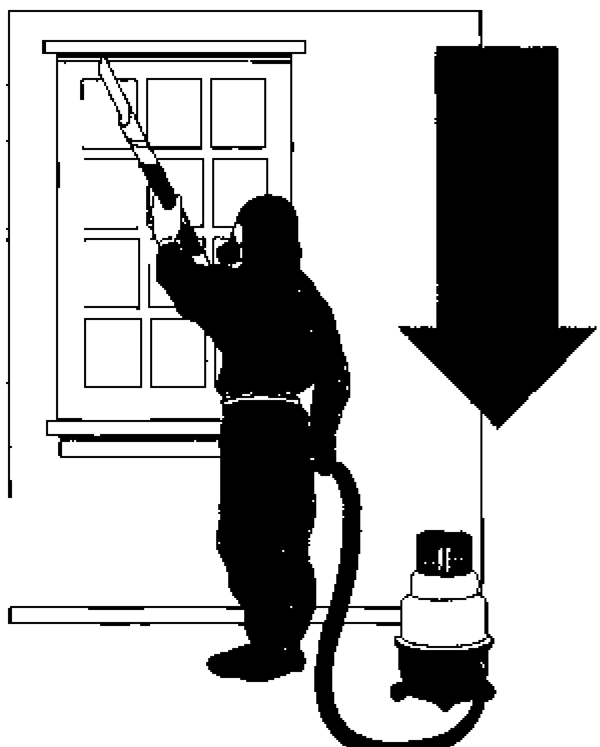
BEST AVAILABLE COPY

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.

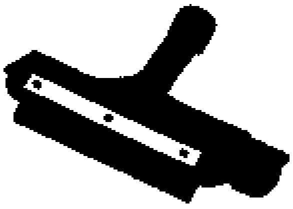
Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

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

Rubber Cone

Dust Brush

Powered Carpet Beater

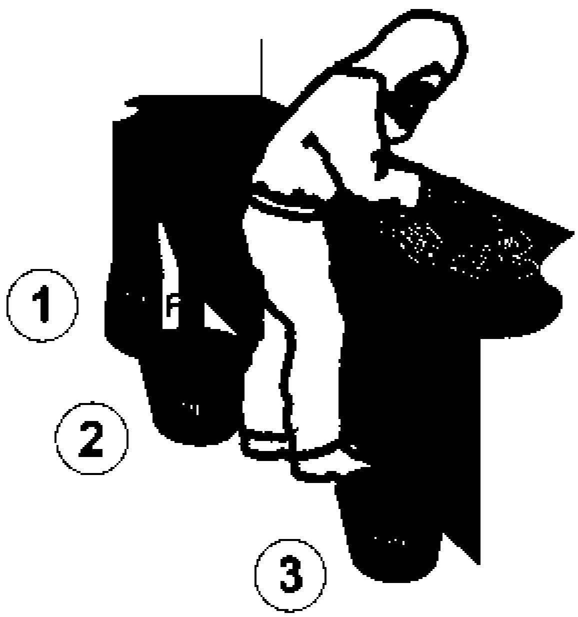


Wheeled Floor Nozzle

BEST AVAILABLE COPY

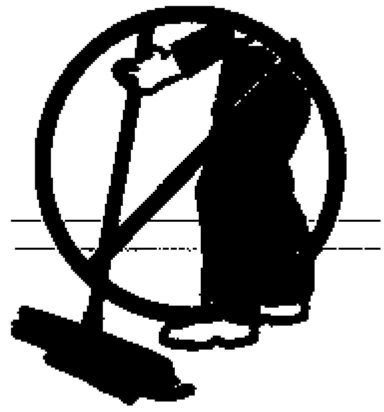
Figure 14.4c (continued)

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



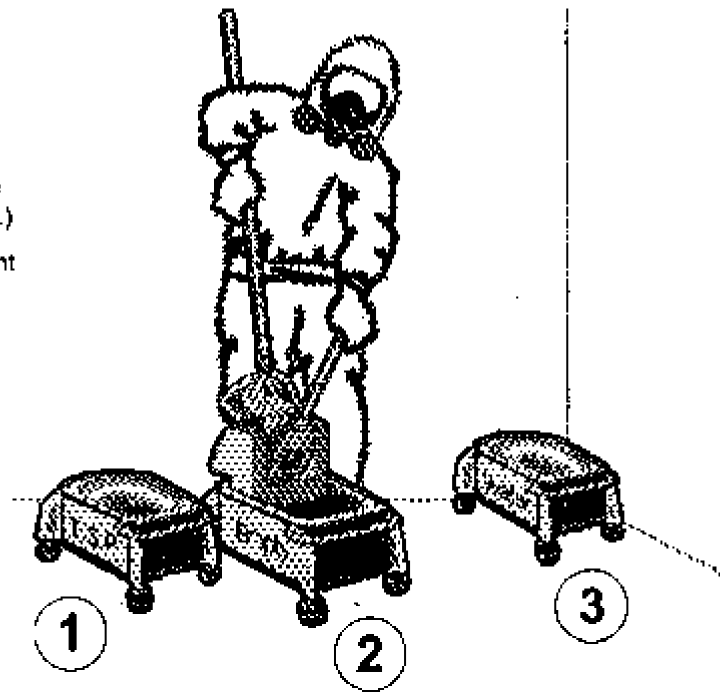
Don't Dry Sweep

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.

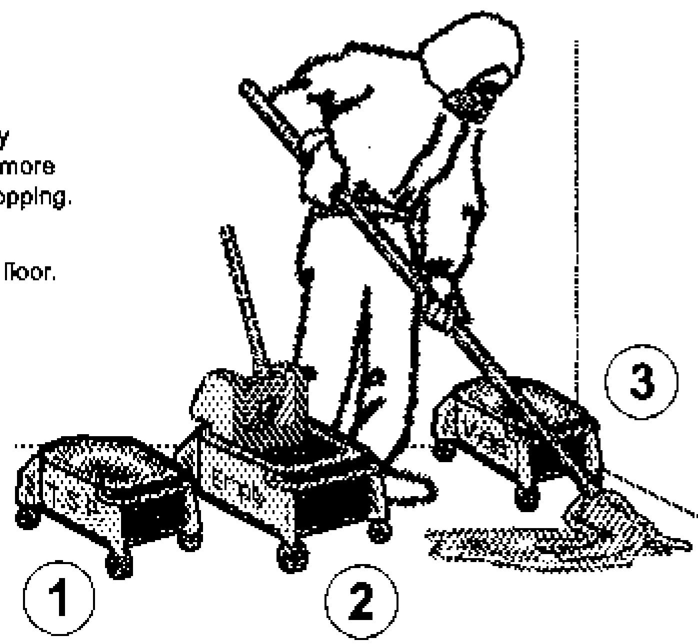
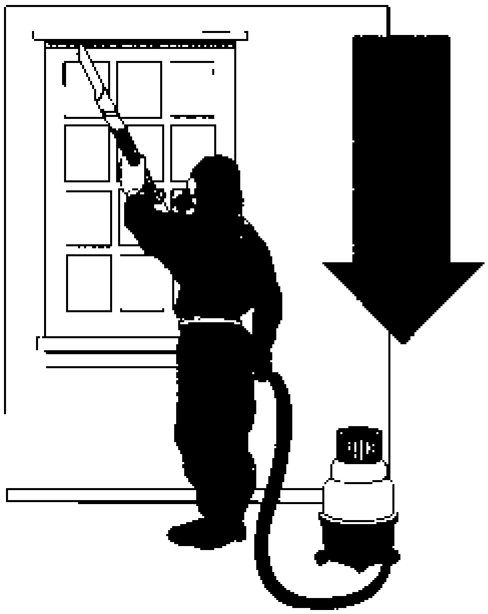


Figure 14.4d (continued)

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.

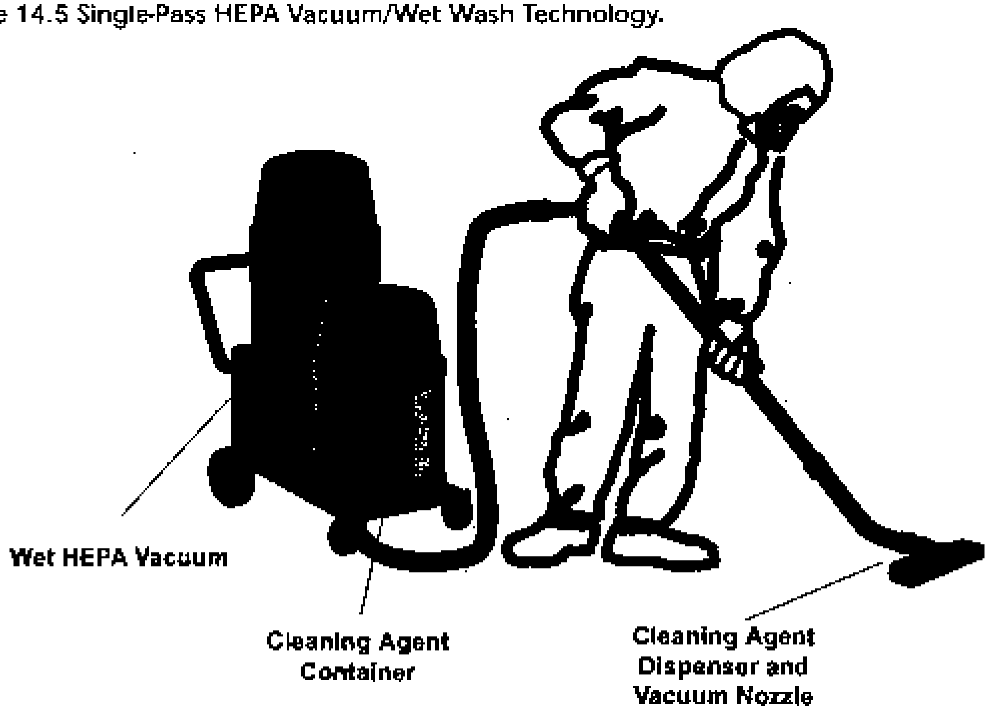
IV. Order of Cleaning Procedures During Lead Hazard Control

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 loaded 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.

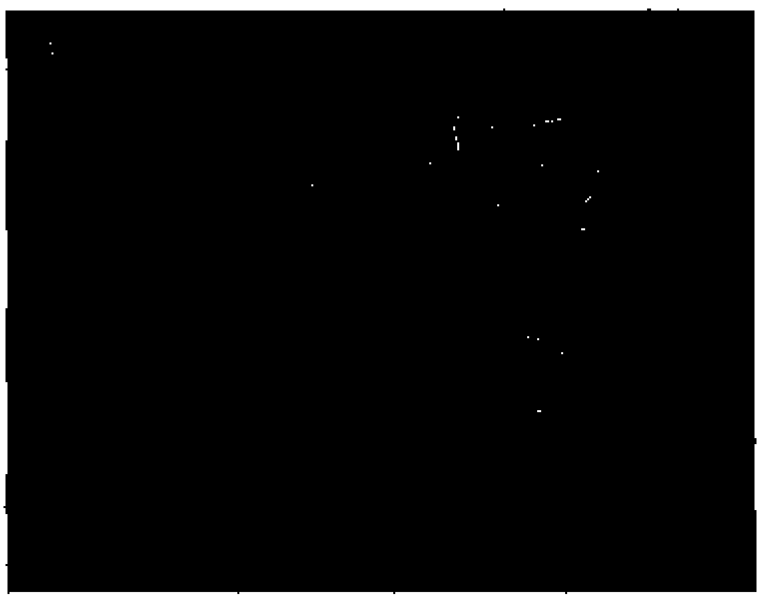


Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

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).

BEST AVAILABLE COPY

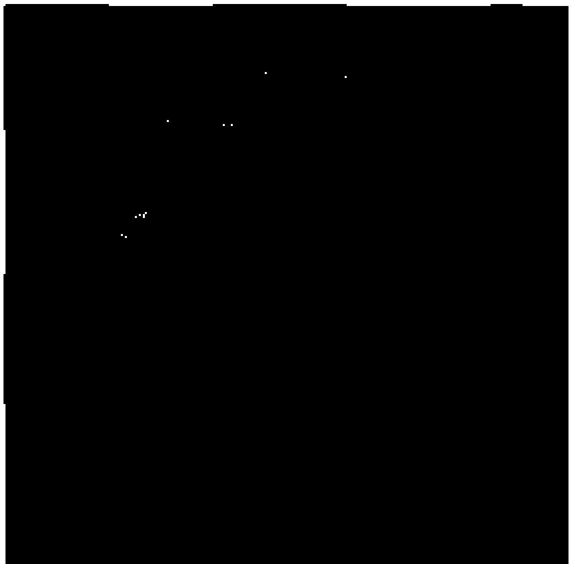


Figure 14.8a Pick Up Corners of Plastic Sheeting.

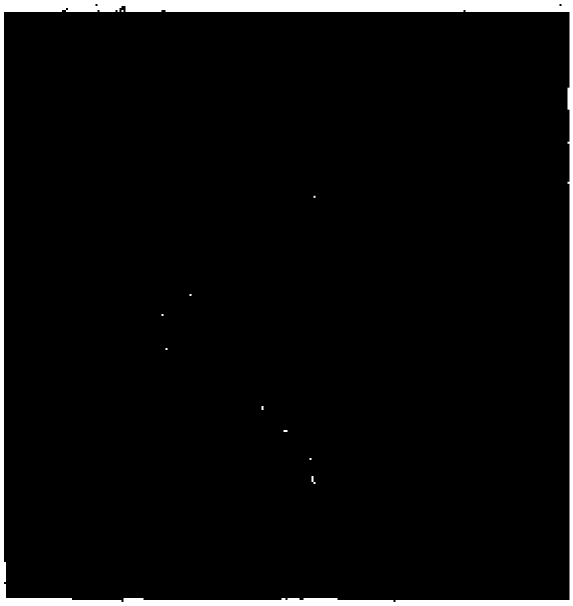


Figure 14.8b Fold Plastic Inward.

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,

BEST AVAILABLE COPY

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).

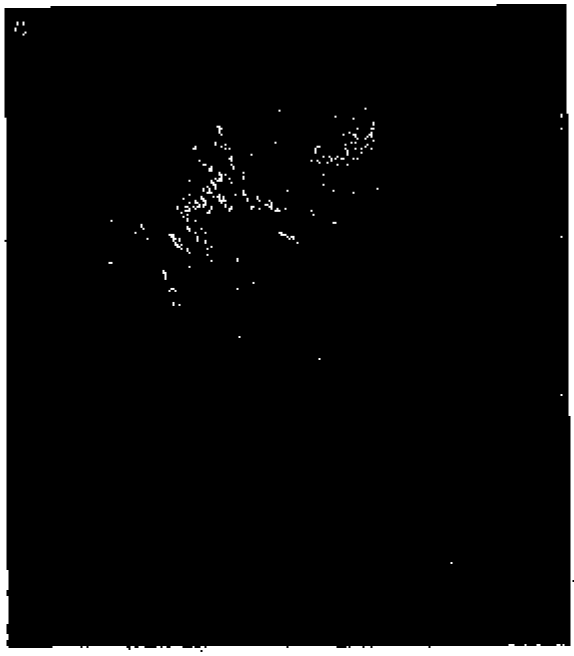


Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

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)

BEST AVAILABLE COPY

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*

Army Facilities Management Information Document on Mold Remediation Issues

TG 277

FEBRUARY 2002

USACHPPM

Readiness thru Health

BEST AVAILABLE COPY

ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

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.

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.

BEST AVAILABLE COPY

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 Indnstrial 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).

BEST AVAILABLE COPY

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 reqnirements 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.

BEST AVAILABLE COPY

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)

BEST AVAILABLE COPY

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

Disposable Protective Clothing

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

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

APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

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.

TG 277

February 2002

Local Reproduction is Authorized and Encouraged.

USACHPPM
Readiness thru Health

Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278

February 2002

USACHPPM

Readiness thru Health

BEST AVAILABLE COPY

Table of Contents

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.

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.

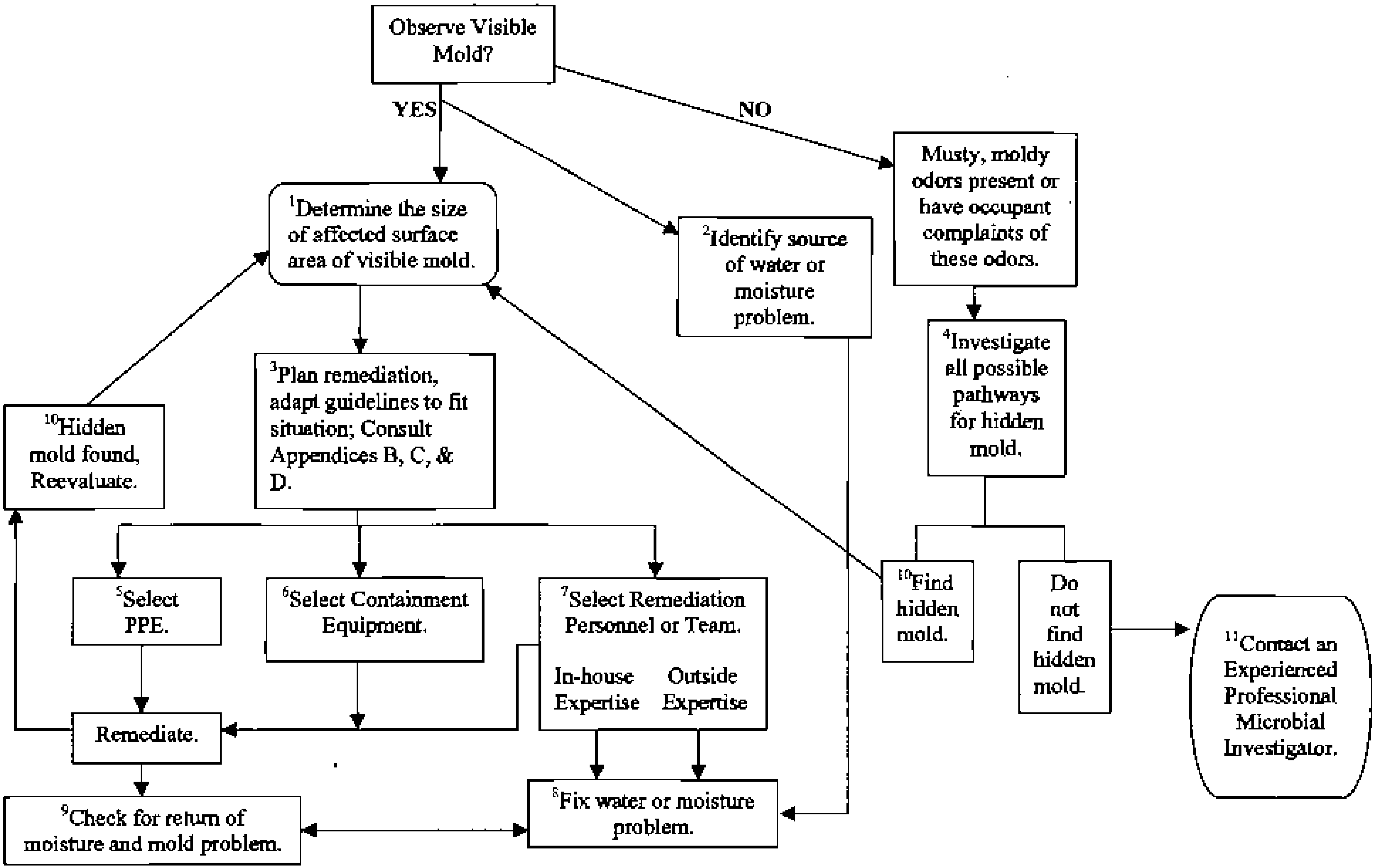
7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

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 unneccessarily, 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.

TG 278

February 2002

Local Reproduction is Authorized and Encouraged.

USACHPPM

Readiness thru Health

BEST AVAILABLE COPY

NATIONAL GUARD BUREAU
ARMY NATIONAL GUARD
REGION NORTH INDUSTRIAL HYGIENE OFFICE
ATTN: NGB-ARS-IHNE
301-IH OLD BAY LANE
HAVRE DE GRACE, MD 21078

NGB-ARS-IHNE (40-5f)

4 March 2009

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

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

2. CONCLUSIONS. Gross contamination from repeated sewer line backups into the garage poses a health threat to personnel. Repeated water intrusions have weakened the structural integrity of one stairway, damaged other areas, and can serve as a source of mold growth in other locations. PACM is present throughout the Armory with many pipes improperly sealed and vinyl asbestos tile (VAT) floors not properly maintained. Implementation of the recommendations listed in this report will contribute to the health and safety of personnel entering these areas.

3. FINDINGS AND RECOMMENDATIONS.

a. Resilient Floor Covering.

(1) Repair the floor surfaces containing VAT. **(RAC 2)**

(2) Maintain VAT floors following Occupational Safety and Health Administration (OSHA) guidance. **(RAC 2)**

b. Family Support Group (FSG) Office. Inspect and repair the damaged ceiling in the FSG Office. **(RAC 2)**

c. Basement Contamination.

(1) Identify and rectify the cause of sewer line backup into the Armory basement. **(RAC 3)**

(2) Remove wooden flooring in Room 1. **(RAC 3)**

(3) Repair radiator leaks in Rooms 1 and 2. **(RAC 3)**

(4) Dispose of any porous materials contaminated by sewage backup in the cage and garage areas, and Rooms 1 and 2, to include wooden cage supports. **(RAC 3)**

(5) Clean and sanitize the entire garage floor to include the cage areas and Rooms 1 and 2. **(RAC 3)**

(6) Ensure personnel performing removal or cleaning operations in sewage contaminated areas are wearing adequate personal protective equipment. **(RAC 3)**

d. PACM. Ensure proper procedures are followed if any repair/remediation aspects will disturb the PACM used as TSI on the pipes. **(RAC 3)**

e. Water Intrusion.

(1) Determine and remediate the water intrusion source in the Room 4 closet and repair damage. **(RAC 4)**

(2) Determine and remediate the water intrusion source in Room 110A closet, repair damaged areas, and clean and disinfect the wooden flooring. **(RAC 3)**

(3) Determine and remediate the source of water intrusion underneath the basement stairs. **(RAC 4)**

(4) Replace damaged structural stair components. **(RAC 3)**

(5) Seal the pipe chases that allow water intrusion into the garage area. **(RAC 3)**

(6) Repair the damaged floors and walls in the Dining Room (Rooms 107/108). **(RAC 4)**

NATIONAL GUARD BUREAU
ARMY NATIONAL GUARD
REGION NORTH INDUSTRIAL HYGIENE OFFICE
ATTN: NGB-ARS-IHNE
301-IH OLD BAY LANE
HAVRE DE GRACE, MD 21078

1. REFERENCES. See Appendix A.

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

3. GENERAL.

a. Survey Personnel. This survey was conducted 9 January 2009 by [redacted], Industrial Hygienist; and [redacted] Certified Industrial Hygienist (CIH) both from the United States Army Center for Health Promotion and Preventive Medicine-North (USACHPPM–North), Fort George G. Meade, Maryland and [redacted] from the National Guard Bureau (NGB), Region North Industrial Hygiene Office, Havre de Grace, Maryland.

b. Background. The NGB Region North Industrial Hygiene Office, Havre de Grace, Maryland as part of their ongoing evaluation of surface lead dust contamination in former IFRs, contracted CHPPM-North to perform this survey.

c. Risk Assessment Codes (RACs). RACs are assigned to recommendations to help quantify risks to personnel and to aid in the establishment of funding priorities for corrective actions. RACs are determined by using the RAC tables from the Department of Defense Instruction (DODI) 6055.1 (reference 1). The Health Hazard Severity table is provided in Appendix B of this report.

d. Assessment Criteria. The United States Army, through DODI 6055.1, Section E3.4.1.2, directs that facilities provide healthful work environments in accordance with the most stringent standards applicable (reference 1). The Occupational Safety and Health Administration (OSHA), through the Code of Federal Regulations, have enforceable regulatory standards for workplace safety (reference 2). The NG Pam 420-15 is not an enforceable regulatory standard that can be applied to the occupational health and safety program for Old Towson Armory; however, it does provide useful recommendations for the cleaning and conversion of former indoor firing ranges (reference 3).

e. Illustrations. Illustrations are provided in Appendix C.

f. Asbestos Inventory. Locations of presumed asbestos containing material (PACM) for thermal surfacing insulation (TSI) are provided in Appendix D.

g. Surface Wipe Sampling for Lead. Surface wipe samples were collected following the guidelines in Chapter 2, Appendix II:2-1 of the OSHA Technical Manual (reference 4). Locations and results of surface wipe sampling for lead are provided in Appendix E.

h. Photographs. Photographs are provided in Appendix F.

4. PROCEDURES. The visit included a visual inspection of the pipe insulation determined to be asbestos containing building material (ACBM); surface wipe sampling for lead dust; and general health and safety observations.

5. FINDINGS AND DISCUSSION.

a. TSI Inventory. A visual inspection was conducted to document the type and condition of thermal surfacing insulation (TSI) in the armory. TSI of PACM was documented as to the location, condition, number of elbows, and linear feet and is presented in Appendix D. Rooms identified as containing PACM TSI are: Rooms 1 and 2 and the garage of the basement; the Drill Hall, Commo Office (Room 113); Male Latrine (Room 115), and Classroom (Room 116) of the first floor; and Office (Room 208) and Gym/Locker Room (Room 210) of the second floor (see Figures F-1 through F-23). The total PACM TSI observed on the pipes was estimated to be 638 linear feet, which included a total of 129 elbows (no RAC assigned).

b. Surface Contamination. Eleven surface wipe samples collected from the furnishings and floors of the former IFR, adjacent areas, and the armory were analyzed for lead (see Figures F-25 through F-28). Results ranged from below detectable levels to 130 micrograms per square foot ($\mu g/ft^2$) (see Appendix E). The samples from the former IFR ranged from 7.3 to 21 $\mu g/ft^2$. 29 CFR 1910.1025(h)(1) states that

BEST AVAILABLE COPY

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

c. Bulk Sample. The Environmental Protection Agency (EPA)/HUD action level for lead based paint is >0.5 percent (%) by mass in dried film (reference 5). The Consumer Product Safety Commission (CPSC) definition of lead containing paint is 0.06% by mass in dried or non-volatile portion (Health). The Army definition of lead contaminated paint is any detectable level of lead. A paint chip located on the ceiling above the drill hall and adjacent to the mezzanine appeared to contain a layer of older paint was collected and analyzed for lead content. The results of analysis determined the paint chip contained 0.05 percent lead (% Pb) by weight (RAC 4).

d. Air Sampling. Air sampling for lead was conducted in the drill hall, mezzanine, and in the converted IFR. All results were below detectable limits (RAC 5).

e. Resilient Flooring Material. The Old Towson Armory has multiple rooms with vinyl asbestos tile (VAT). These floor tiles vary in color and condition. For the most part the tile is damaged, scratched, or loose/dislodged, and appears not to have been maintained. Inventory of the flooring material was beyond the scope of this survey but was notated due to its abundance (see Figures F-29 through F-34). A standard interpretation for 29 CFR 1910.1001 dated 5 November 2007 reference OSHA compliance instructions concerning asbestos and includes instructions for maintaining VAT (reference 2) (RAC 2).

f. Family Support Group, Room 123A. The ceiling in the FSG Office is in extremely poor condition. Plaster is loose and some has dislodged, there are multiple water stains, and areas where the sheetrock joints appear unstable and could collapse (Figures F-35 and F-36). This area should be inspected and repaired before being reoccupied (RAC 2).

g. Basement Contamination.

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

(2) The plywood flooring in Room 1 is an elevated platform that was reportedly placed there due to the water and sewage intrusion. This wooden floor is contaminated with the sewage residue and should be removed and properly disposed of (RAC 3).

(3) The caged area is also contaminated, to include the wood cage frames and contents. The cage areas should be emptied and the entire area cleaned and sanitized. Any wood or other porous material should be discarded (RAC 3).

(4) The radiators located on the ceilings in both Rooms 1 and 2 are leaking. Keeping these areas wet will support growth from the fecal contamination. The radiators should be repaired. Special precautions should be instituted if asbestos remediation is involved (RAC 2).

(5) Individuals performing remediation in these areas should wear personal protective equipment to avoid contamination. Precautions during remediation include avoiding aerosolizing the contaminated material; handwashing; wearing goggles, a N, R, or P95 respirator, watertight boots, and waterproof gloves. The cause of the backup should be identified and remediated to prevent future backups of this nature (RAC 3).

(6) 29 CFR 1910.141(a)(3) (Sanitation), specifies that all places of employment shall be kept clean to the extent that the nature of the work allow. The floor of every workroom shall be maintained, so far as practical in a dry condition. In addition, all sweepings, solid or liquid wastes, refuse, and garbage shall be removed in such a manner as to avoid creating a menace to health and as often as necessary to maintain the place of employment in a sanitary condition (reference 2) (no RAC assigned).

h. Water Intrusion.

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

BEST AVAILABLE COPY

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

(2) Basement Stairs. The area underneath the wooden stairs in the basement is deteriorated due to recurring water intrusion. The source of the water should be identified and eliminated. One of the support beams is damaged and has weakened the integrity of the stairs structure. This support should be replaced (Figures F-47 and F-48). This continued water contact in the area will support mold growth and pose a risk to building materials, as well as to health and should be remediated (TG 277, reference 6) (RAC 3).

(3) Foundation. Water intrusion through pipe access through the concrete foundation is numerous throughout the garage area and has resulted in extensive damage to the area. These openings should be properly sealed (Figure F-49). If water follows pipes to TSI, PACM will likely be damaged and could trigger fiber release episodes (reference 2) (RAC 2).

i. Rooms 107/108. The dining room has extensive damage to the floor tile. Many areas of the wall have cracked and are in need of repair (Figures F-50 through F-52). The floor tile does not appear to be the type or age that would contain asbestos (RAC 4).

6. CONCLUSIONS. Gross contamination from repeated sewer line backups into the garage poses a health threat to personnel. Repeated water intrusions have weakened the structural integrity of one stairway, damaged other areas, and can serve as a source of mold growth in other locations. PACM is present throughout the Armory with many pipes improperly sealed and VAT floors not properly maintained. Implementation of the recommendations listed in this report will contribute to the health and safety of personnel entering these areas.

7. RECOMMENDATIONS.

a. Resilient Floor Tile.

(1) Repair the VAT floor surfaces (reference 2). **(RAC 2)**

(2) Maintain VAT floors following OSHA guidance (reference 2). **(RAC 2)**

b. FSG Office. Inspect and repair the damaged ceiling (reference 2). **(RAC 2)**

c. Basement Contamination.

(1) Identify and rectify the cause of sewage line backup into the Armory Basement (references 2 and 6). **(RAC 3)**

(2) Remove wooden flooring in Room 1 (references 2 and 6). **(RAC 3)**

(3) Repair radiator leaks in Rooms 1 and 2 (references 2 and 6). **(RAC 3)**

(4) Dispose of any porous materials in the cage and garage areas, and Rooms 1 and 2, to include wooden cage supports and items contaminated by sewage (references 2 and 6). **(RAC 3)**

(5) Clean and sanitize the entire garage floor to include the cage areas and Rooms 1 and 2 (references 2 and 6). **(RAC 3)**

(6) Ensure personnel performing removal or cleaning operations in sewage contaminated areas utilize adequate PPE (references 2 and 6). **(RAC 3)**

d. PACM. Ensure proper procedures are followed if any repair/remediation aspects will disturb the TSI PACM on the pipes (reference 2). **(RAC 3)**

e. Water Intrusion.

(1) Determine and remediate the source of water intrusion in the Room 4 closet and repair damage (references 2 and 6). **(RAC 4)**

(2) Determine and remediate the source of the water intrusion in the closet (Room 110A), repair damaged area, clean and disinfect the wooden flooring (references 2 and 6). **(RAC 3)**

(3) Determine and remediate the source of water intrusion underneath the basement stairs (references 2 and 6). **(RAC 4)**

(4) Replace damaged structural stair components (reference 2). **(RAC 3)**

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

(5) Seal pipe chases that allow water intrusion into the garage area (references 2 and 6). **(RAC 3)**

(6) Repair the damaged floors and walls in the Dining Room (Rooms 107/108) (references 2). **(RAC 4)**

8. ADDITIONAL ASSISTANCE. Point of contact for this action and other industrial hygiene related topics is Ms. [redacted] NGB Regional Industrial Hygienist, (410) 942-0273, ext 23.

[redacted]

Industrial Hygienist

APPROVED BY:

[redacted]

NGB Regional Industrial Hygienist

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

APPENDIX A
REFERENCES

1. Department of Defense Instruction (DODI) 6055.1, DOD Safety and Occupational Health (SOH) Program, 19 August 1998.

2. Title 29 Code of Federal Regulations (CFR), Part 1910, 2008 Edition, Occupational Safety and Health Administration (OSHA).

3. National Guard Pamphlet (NG Pam) 420-15, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, National Guard Bureau (NGB), 3 November 2006.

4. OSHA Technical Manual (TED 01-00-015), 24 June 2008.

5. Residential Lead-Based Paint Hazard Reduction Act of 1992--Title X, Public Law 102-550, 28 October 1992.

6. US Army Center for Health Promotion and Preventive Medicine (USACHPPM), Technical Guide 277, Army Facilities Management Information Document on Mold Remediation Issues, February 2002

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

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

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

a. Exposure Points Assessed

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

*AER = Alternate exposure route, such as skin absorption, ingestion.
†AL = Action level, DoD component threshold that triggers surveillance actions, such as microWatts/cm^2, dB, parts per million.
‡OEL = Occupational Exposure Limit, DoD exposure limit, such as Threshold Limit Value and Permissible Exposure Limit.

b. Medical Effects Points Assessed

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

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

Total Points (sum of A and B, above)	HHSC
13-17	I
9-12	II
5-8	III
0-4	IV

BEST AVAILABLE COPY

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

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

a. Duration of Exposure Points Assessed

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

b. Number of Exposed Personnel Points Assessed

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

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

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

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

HHSC	ILLNESS PROBABILITY CODE			
	A	B	C	D
I	1	1	2	3
II	1	2	3	4
III	2	3	4	5
IV	3	4	5	5

4. RAC Descriptor

RAC	DESCRIPTOR
1	CRITICAL
2	SERIOUS
3	MODERATE
4	MINOR
5	NEGLIGIBLE

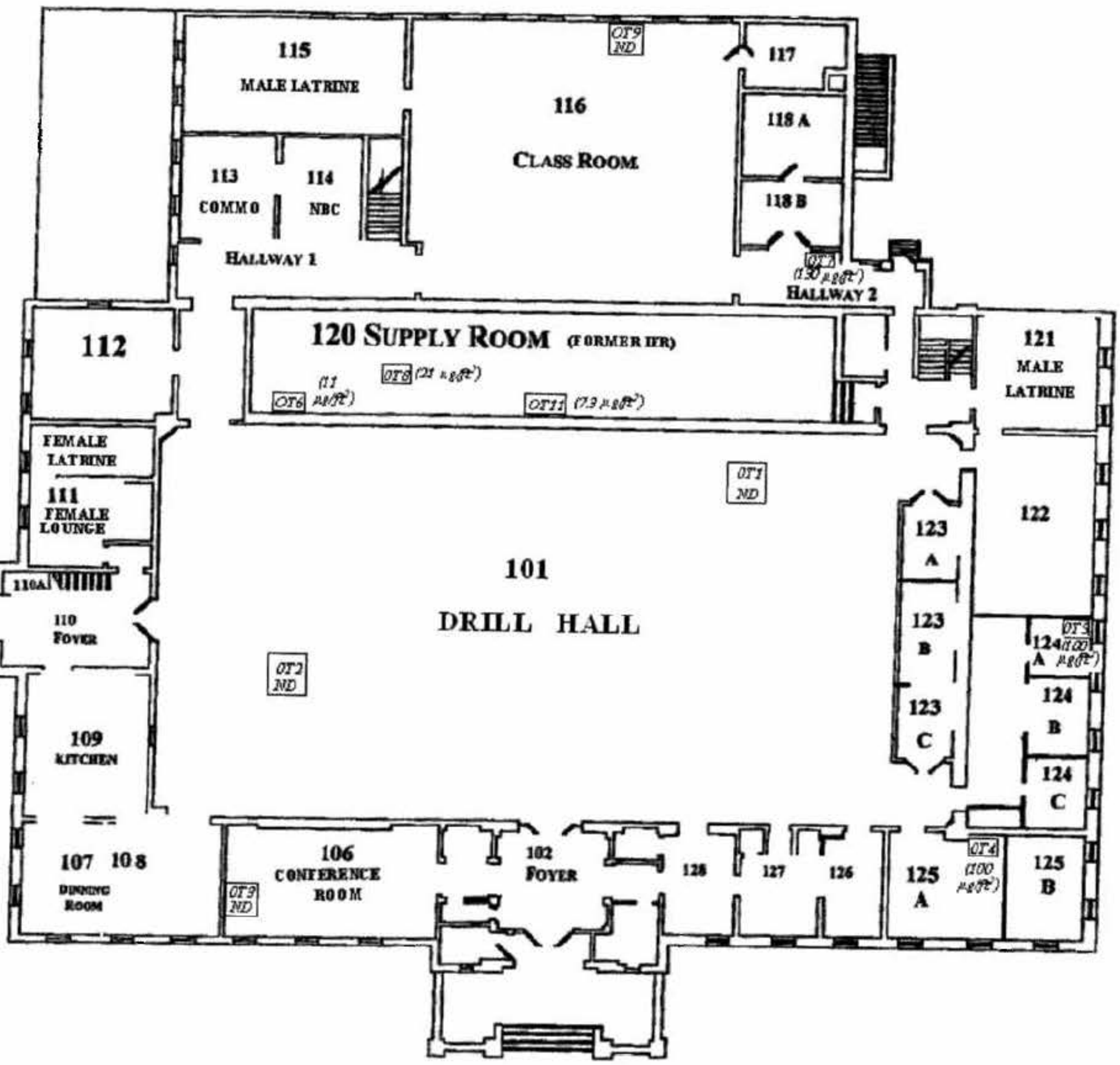
From Table E7, T2 of Department of Defense Instruction 6055.1, Department of Defense Occupational Safety and Health Program, 19 August 1998 (reference 1).

BEST AVAILABLE COPY

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

APPENDIX C
ILLUSTRATIONS

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

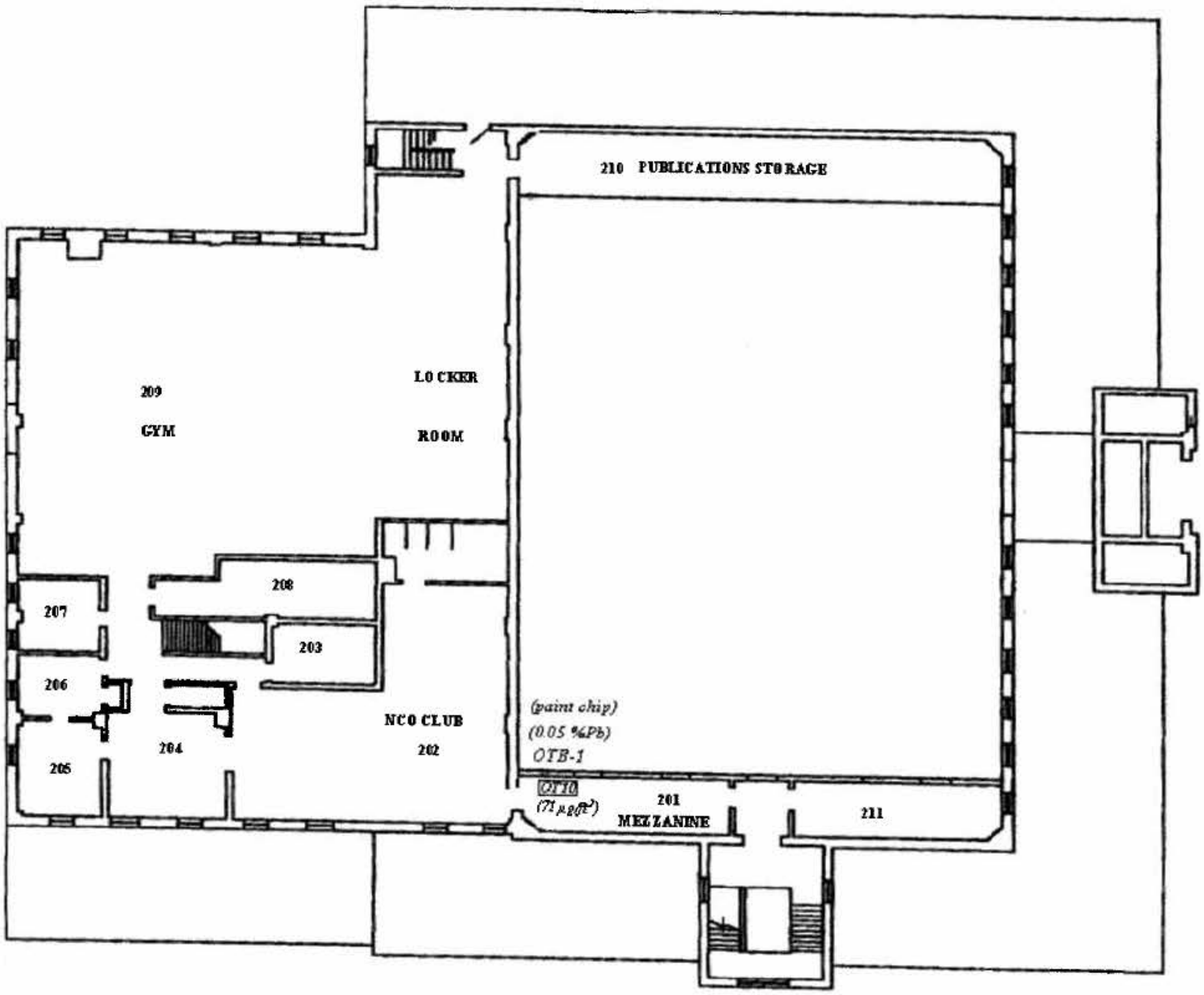


BEST AVAILABLE COPY

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

Appendix C, continued

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

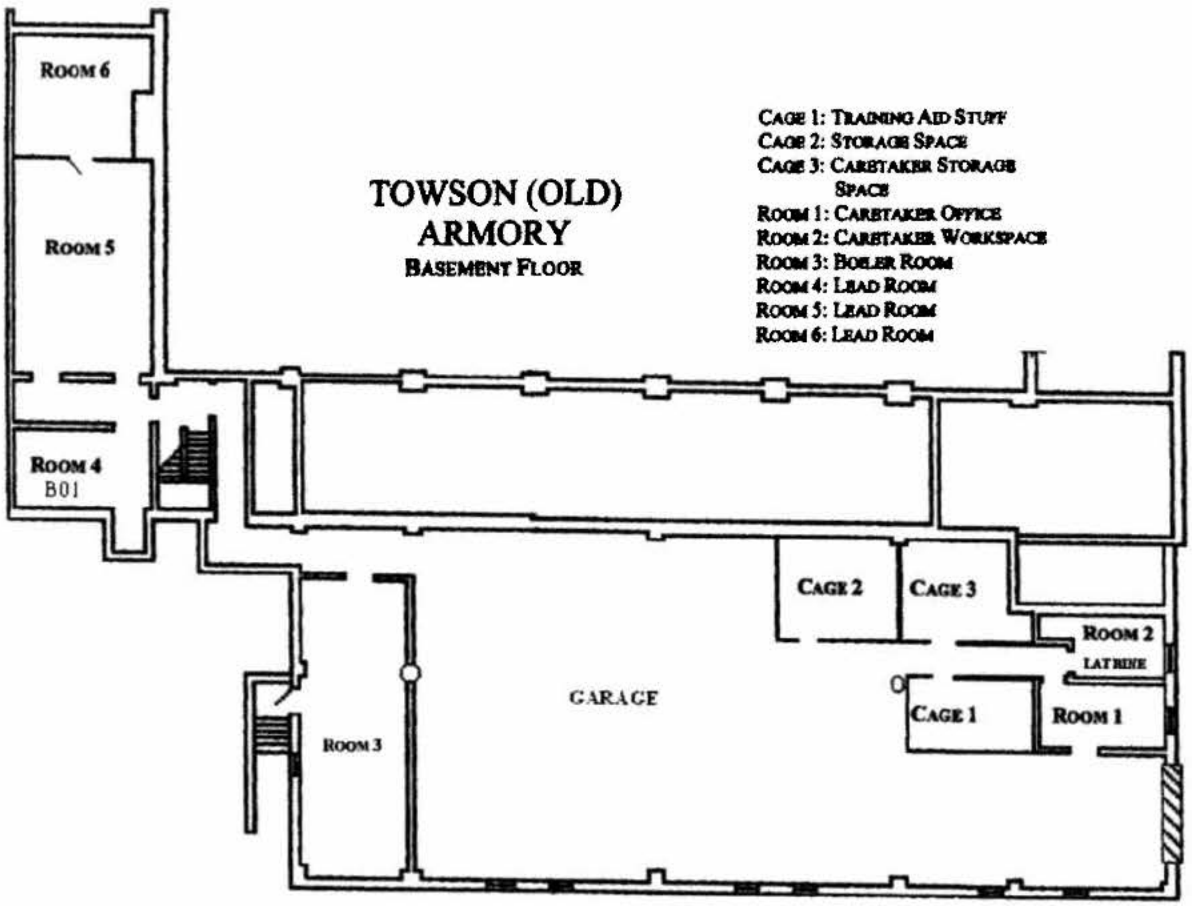


BEST AVAILABLE COPY

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

Appendix C, continued

Figure C-2: Old Towson Armory, Basement.



BEST AVAILABLE COPY

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

APPENDIX D

OLD TOWSON ARMORY TSI INVENTORY

Table D-1. TSI Inventory, Basement

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

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

BEST AVAILABLE COPY

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

Appendix D, continued

Table D-2. TSI Inventory, First Floor

Room Number	Designation	Linear Feet	El-bows	Comments
101	Drill Hall	106	29	1 open elbow, 5 dam./open areas
102	Foyer	0	0	No TSI observed
106	Conference Rm	0	0	No TSI observed
107/108	Office	0	0	No TSI observed
109	Kitchen	0	0	No TSI observed
110	Foyer	0	0	No TSI observed
110A	Storage Room	0	0	No TSI observed
111	Women's	0	0	No TSI observed
112	Storage Room	0	0	No TSI observed
113	Commo/Office	10.3	4	1 ft open area, 1 damaged elbow
114	NBC Room	0	0	No TSI observed
115	Men's Room	34.9	12	7 open ends, 1 repair with duct tape, 2 cracks at elbows
116	Classroom	16	0	damaged bottom, 3" rip at bottom
117	Vault-Locked	0	0	No Access
118A	Vault-Locked	0	0	No Access
118B	Vault-Locked	0	0	No Access
121	Men's Room	0	0	No TSI observed
122	Supply Room	0	0	No TSI observed
123A	Family Support	0	0	No TSI observed
123B	Office	0	0	No TSI observed
123C	Storage Room	0	0	No TSI observed
124	Offices	0	0	No TSI observed
125A	Office	0	0	No TSI observed
125B	Office	0	0	No TSI observed
126	Office	0	0	No TSI observed
127	Office	0	0	No TSI observed
128	Office	0	0	No TSI observed
128A	Storage Room	0	0	No TSI observed
129	Restroom	0	0	No TSI observed

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

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

Appendix D, continued

Table D-3. TSI Inventory, Second Floor

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

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

Facility Total TSI: 638.2 linear feet 129 Elbows

BEST AVAILABLE COPY

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

APPENDIX E

SAMPLE RESULTS

Figure. Surface Wipe Sample Results for Lead.

Sample Location	Sample ID	Results ($\mu g/ft^2$)	Acceptable?*
Drill Hall Floor (closest to IFR)	OT1	<6.8	Yes
Drill Hall Floor (other side, 3 pt line)	OT2	<6.8	Yes
Rm 106, Conference Rm (Top of speakers by temp wall)	OT3	<6.8	Yes
Room 125A, Locker 171	OT4	100	Yes
Room 124A (Top Shelf)	OT5	100	Yes
Supply Room (old IFR), back shelf, 2nd from top	OT6	11	Yes
Hall by classroom and Room 118 (top of cabinet)	OT7	130	Yes
Floor Supply Room (old IFR)	OT8	21	Yes
Classroom (filing cabinet top, 3rd window vault side)	OT9	<6.8	Yes
Mezzanine filing cabinet nearest 202	OT10	71	Yes
Supply Room, middle of room, metal shelf top shelf	OT11	7.3	Yes
BLANK		<0.75	N/A

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

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

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

APPENDIX F

PHOTOGRAPHS

Examples of exposed ACBM

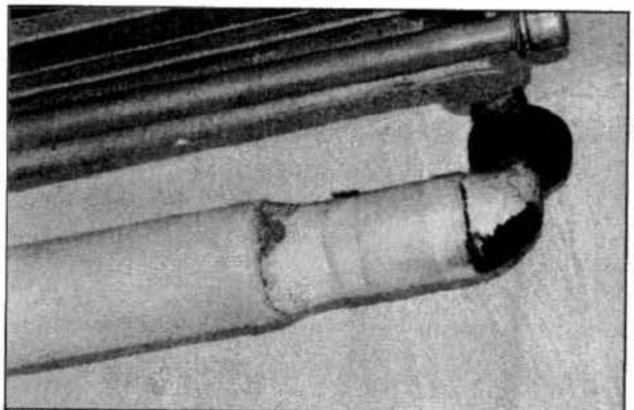


Figure F-1. Basement, Room 2

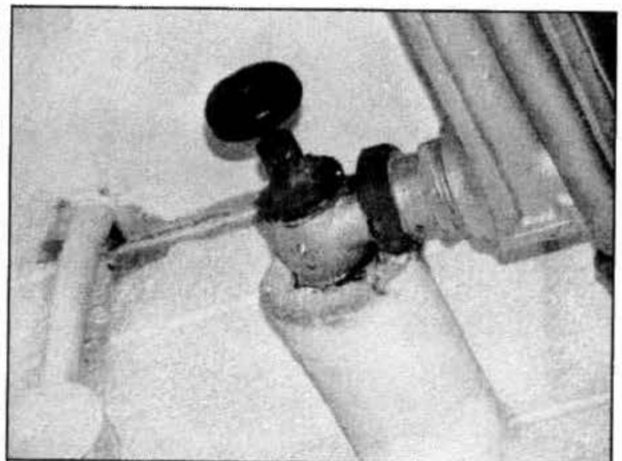


Figure F-2. Basement, Room 2

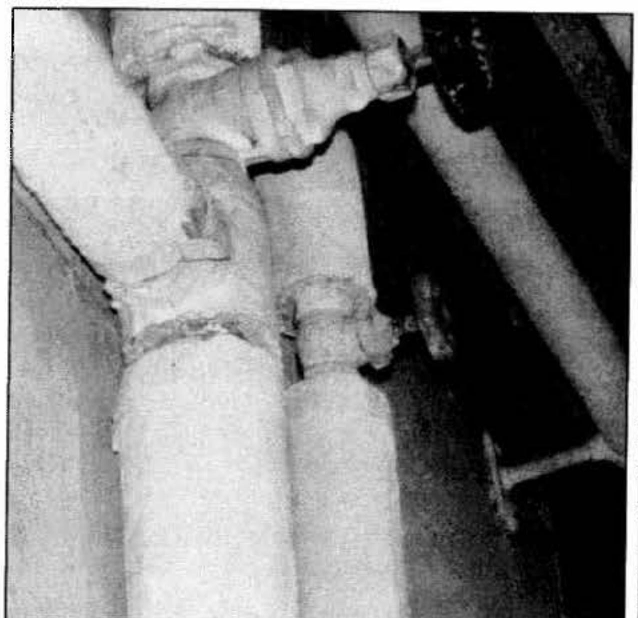


Figure F-3. Basement Room 2

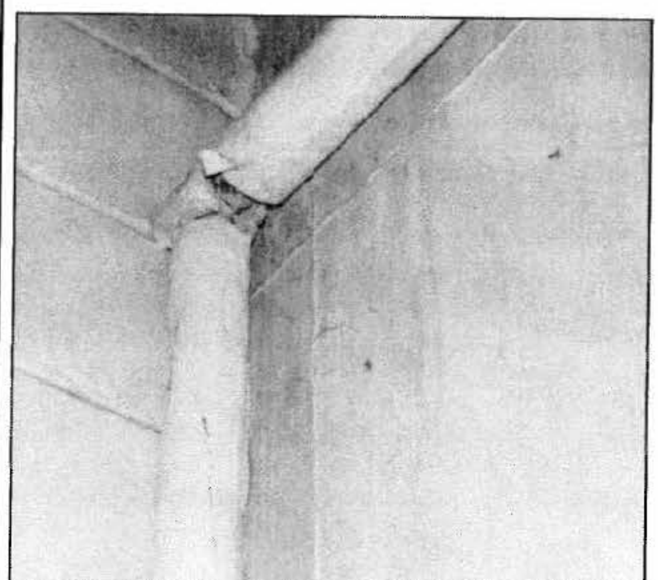


Figure F-4. Basement Room 2

BEST AVAILABLE COPY

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

APPENDIX F, continued

Examples of exposed ACBM

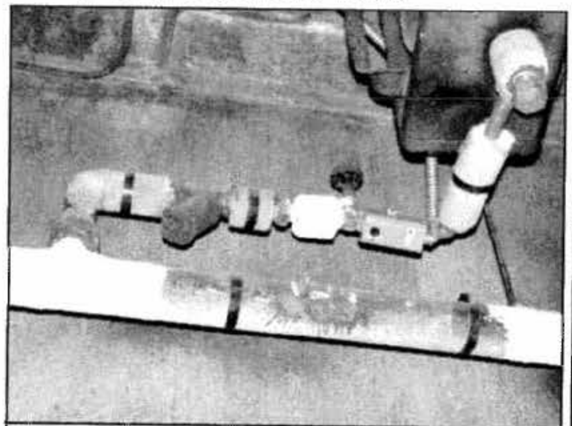


Figure F-5. Garage, heater

Figure F-6. Garage, heater

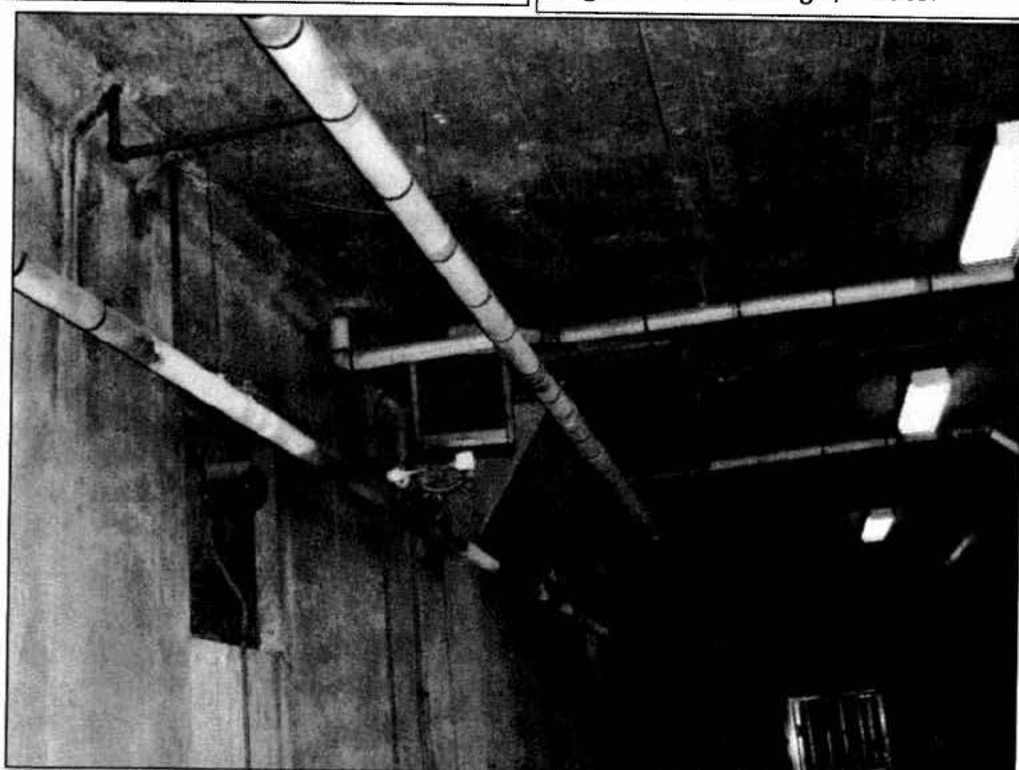


Figure F-7. Garage pipes with PACM TSI, note areas of water intrusion from pipes chases through the foundation.

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

APPENDIX F, continued

Examples of exposed ACBM

Figure F-8. Garage, pipes with TSI

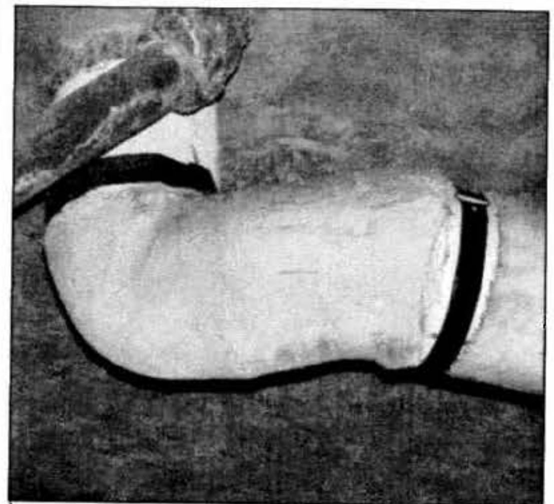


Figure F-9. Garage

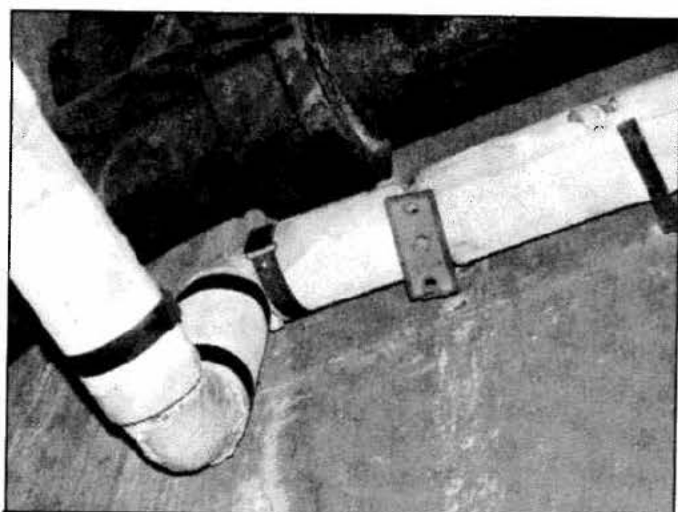


Figure F-10. Garage

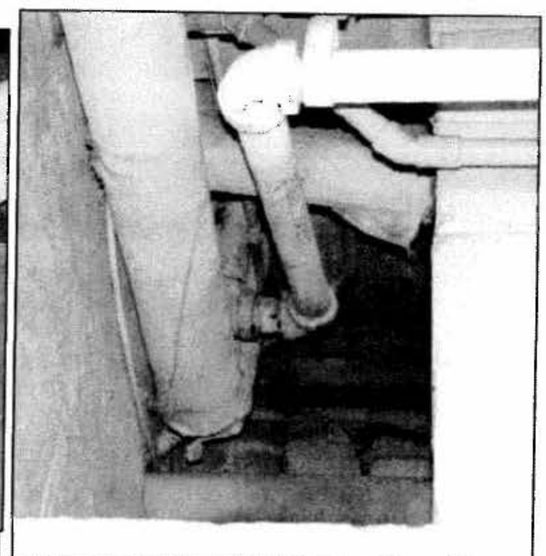


Figure F-11. Basement Hallway

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

APPENDIX F, continued

Examples of exposed ACBM

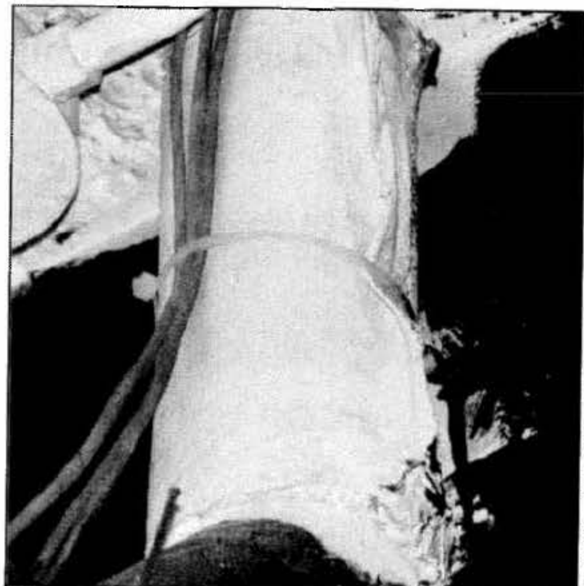


Figure F-12. Commo Office

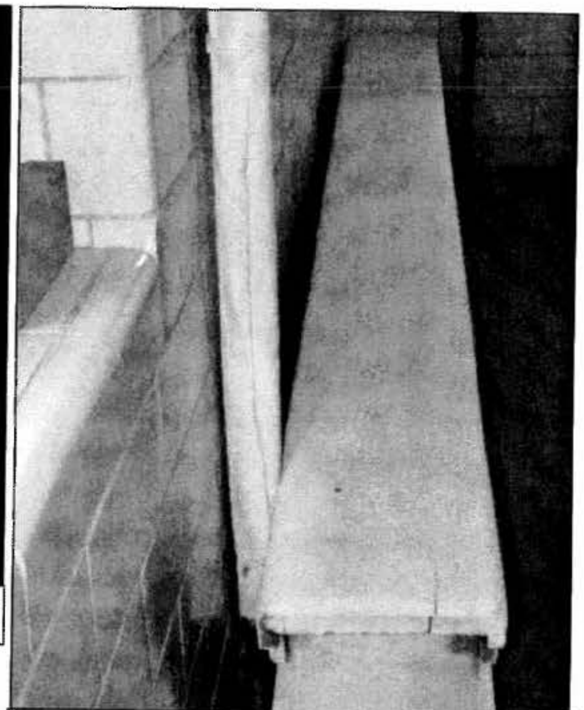


Figure F-13. Male Latrine by Shower Bench

Figure F-14. Male Latrine by stalls

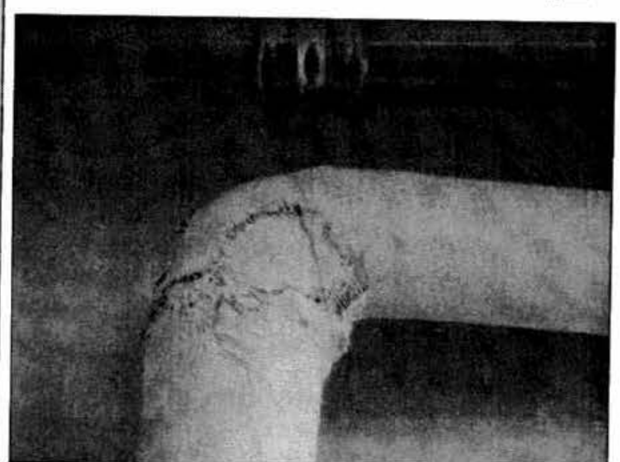


Figure F-15. Old Male Latrine

BEST AVAILABLE COPY

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

APPENDIX F, continued

Examples of exposed ACBM

Figure F-16. Old Male Latrine

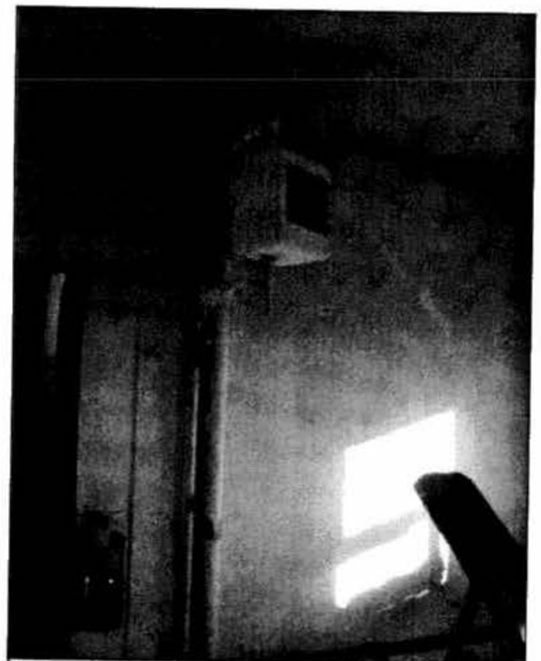


Figure F-17. Example of the heaters and TSI in the Gym

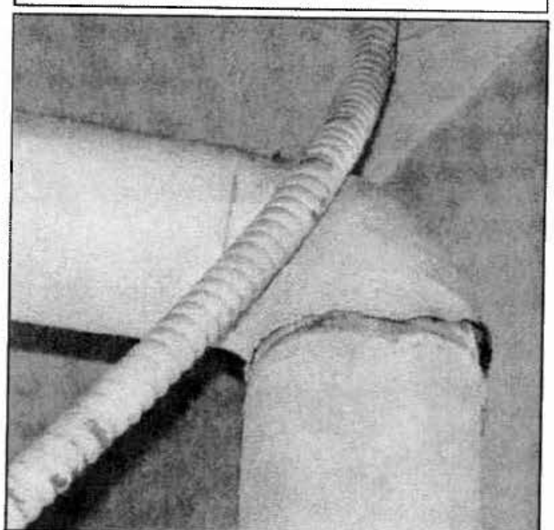


Figure F-18. Gym side

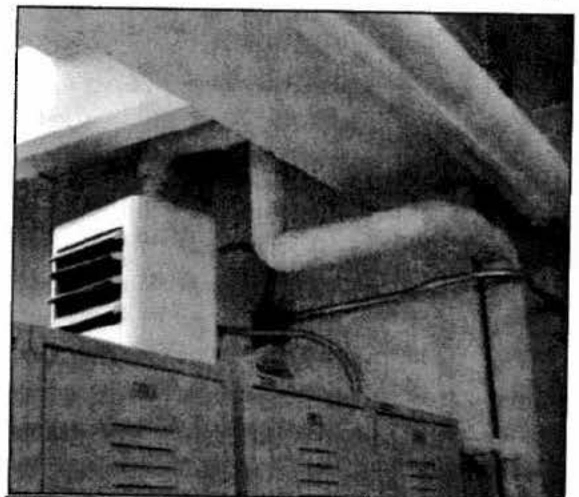


Figure F-19. Locker side

APPENDIX F, continued

Examples of exposed ACBM

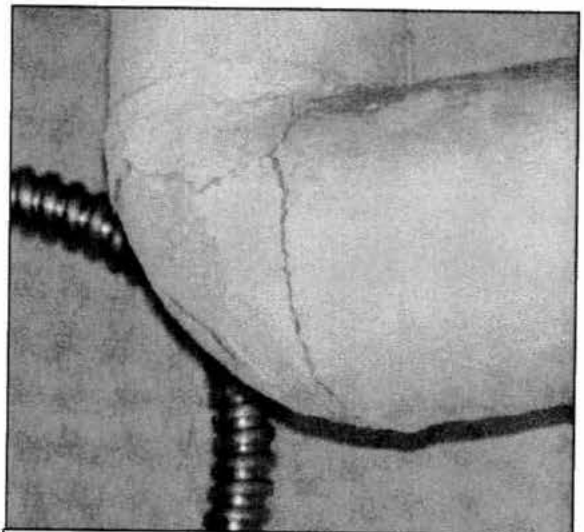


Figure F-20. Locker side

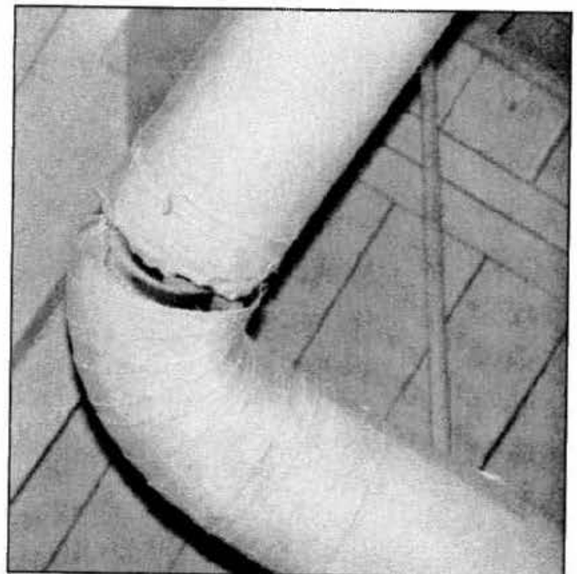


Figure D-21. Drill Hall

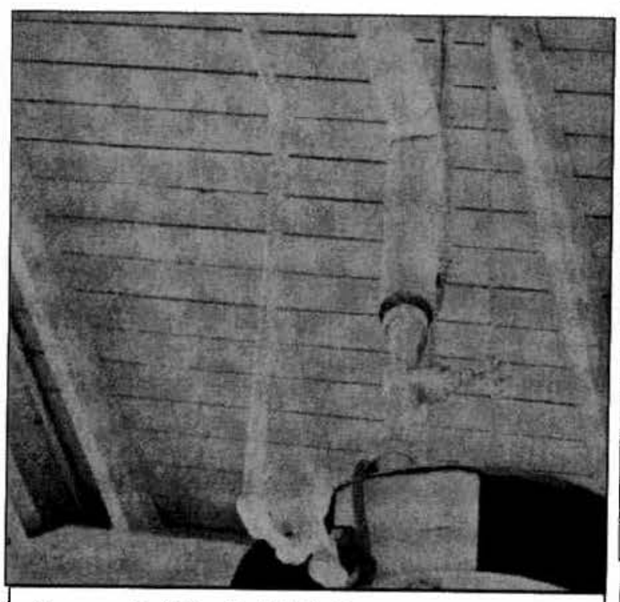


Figure D-22. Drill Hall

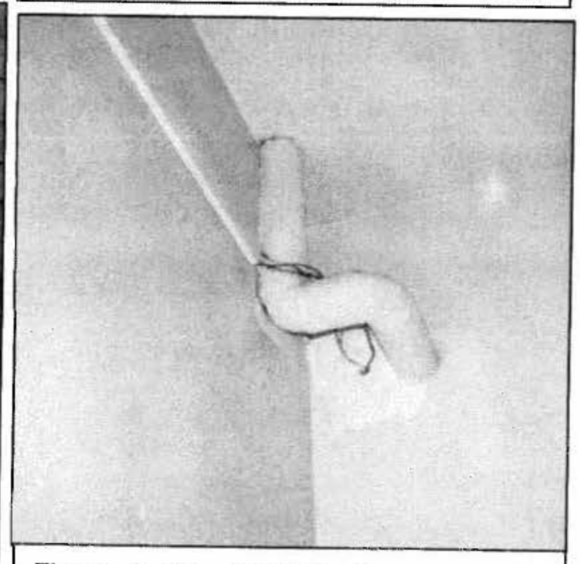


Figure D-23. Hallway 1

BEST AVAILABLE COPY

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

APPENDIX F, continued

Wipe Sample Locations

Figure F-23. Wipe Sample, Supply Room, metal shelf, middle of room.

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

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

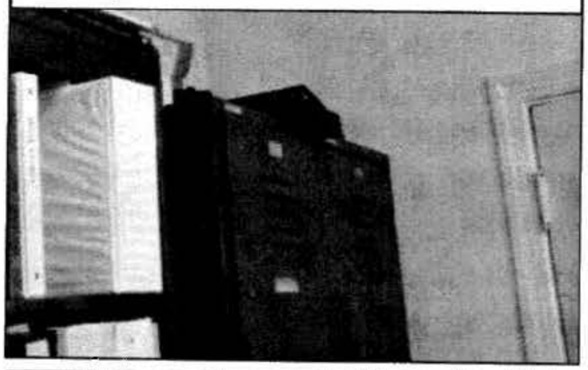
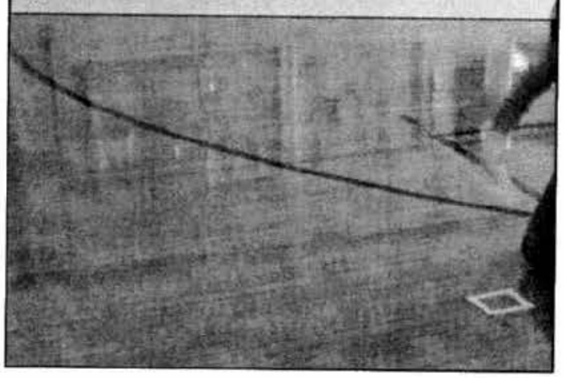


Figure F-28. Wipe Sample, back shelf, 2nd from top.

Figure F-27. Wipe Sample, Drill Hall



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

APPENDIX F, continued

Vinyl Asbestos Tile

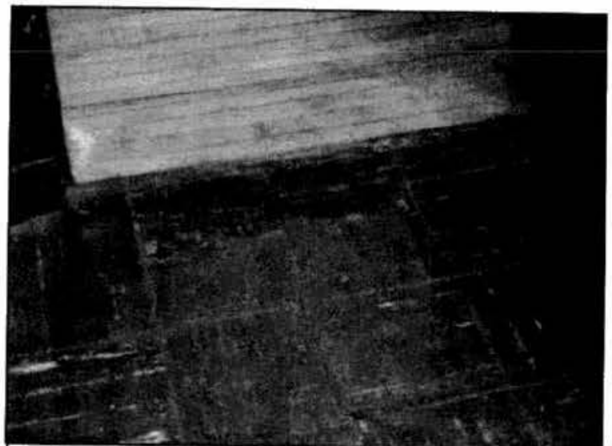


Figure F-29. Room 122

Figure F-30. Room 122

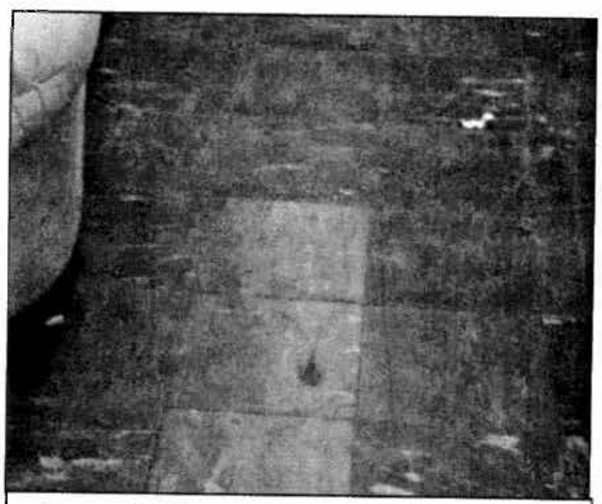


Figure F-32. Room 124

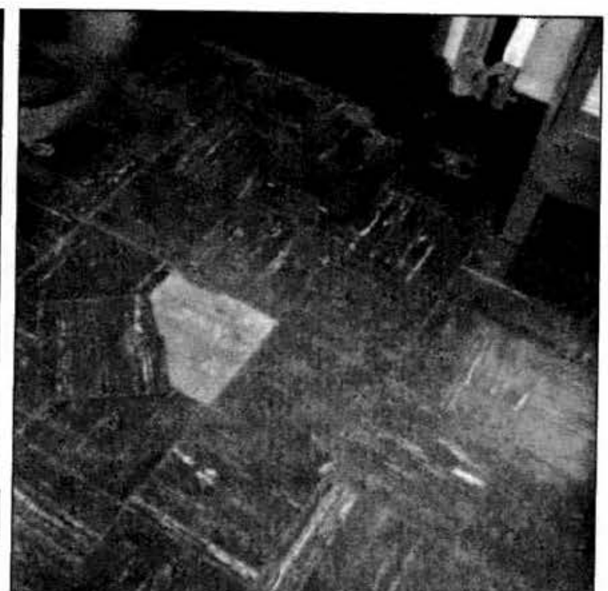


Figure F-31. Room 122

BEST AVAILABLE COPY

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

APPENDIX F, continued

Vinyl Asbestos Tile

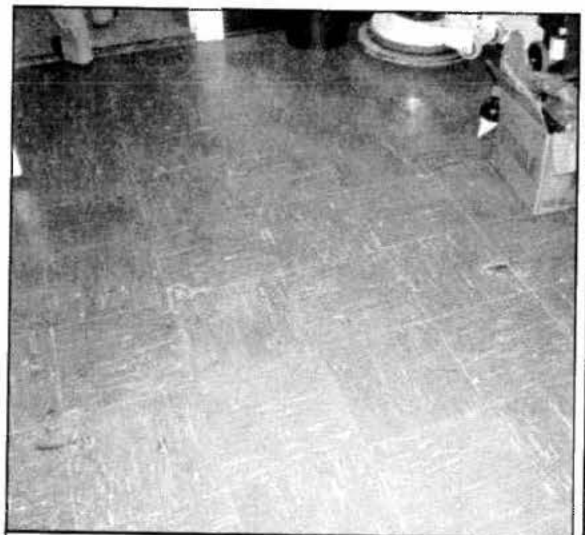


Figure F-33. Room 112

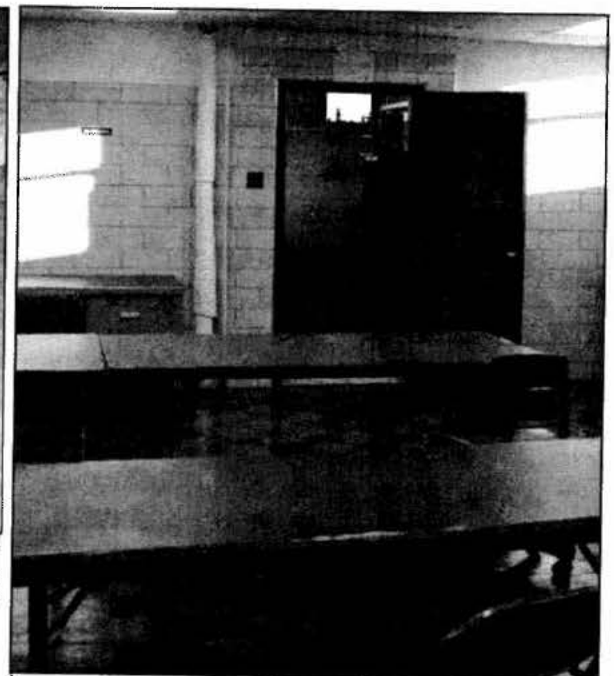


Figure F-34. Room 112

Family Support Group

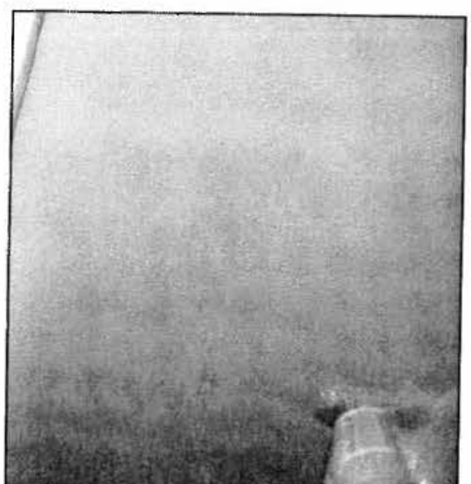


Figure F-35. Family Support Group, damaged ceiling

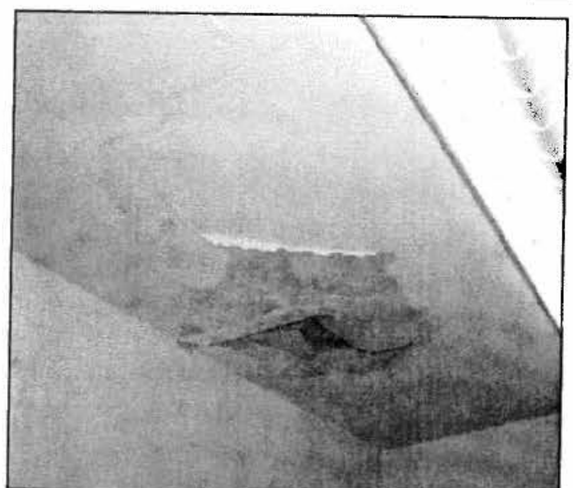


Figure F-36. Family Support Group, damaged ceiling

BEST AVAILABLE COPY

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

APPENDIX F, continued

Fecal Contamination from Sewage Backup

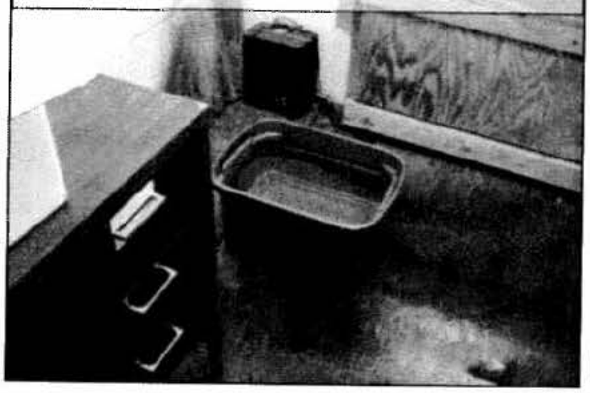


Figure F-37. Room 1


Figure F-38. Room 1


Figure F-40. Room 2


Figure F-39. Hall by Room 1


Figure F-41. Room 2

BEST AVAILABLE COPY

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

APPENDIX F, continued

Water Intrusion

Figure F-42. Room 1, Leaky radiator

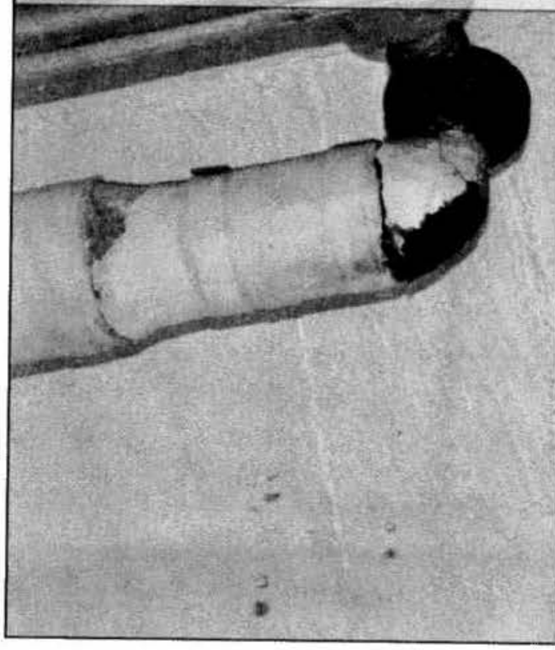


Figure F-43. Room 4

Figure F-44. Room 4

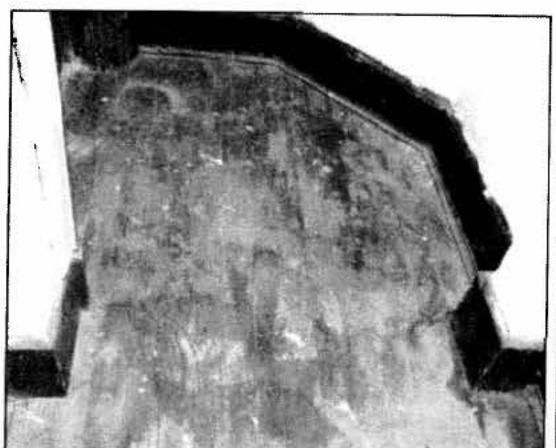


Figure F-45. Room 110A

Figure F-46. Room 110A

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

APPENDIX F, continued

Water Intrusion

Figure F-47. Stairway area by Room 4

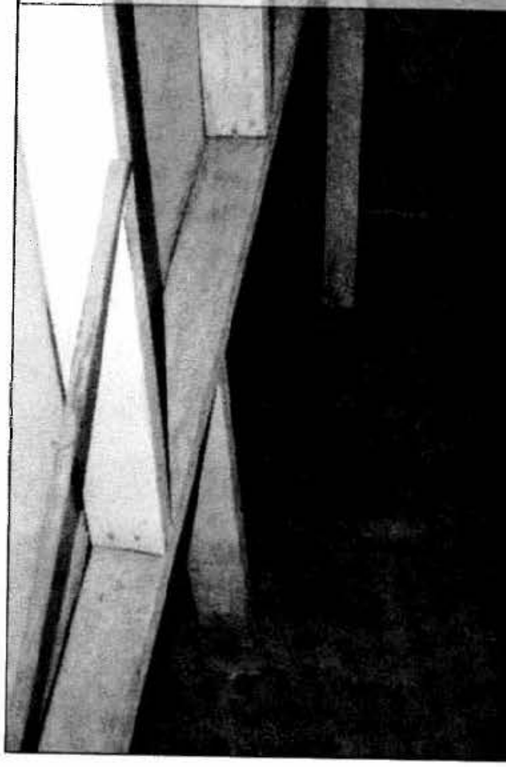


Figure F-49. Pipes through foundation causing water intrusion

Figure F-48. Stairway area by Room 4

APPENDIX F, continued

Dining Room

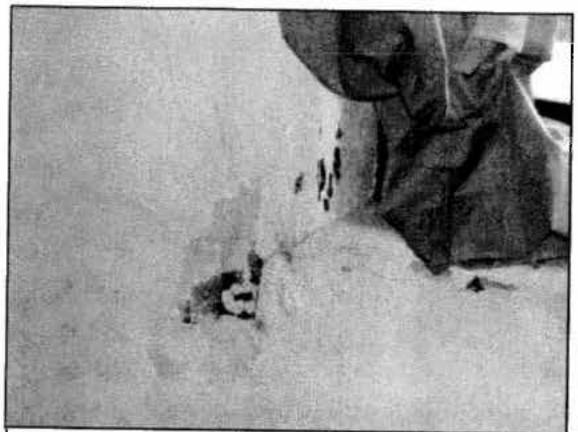


Figure F-50. Dining Room, wall and sill damage

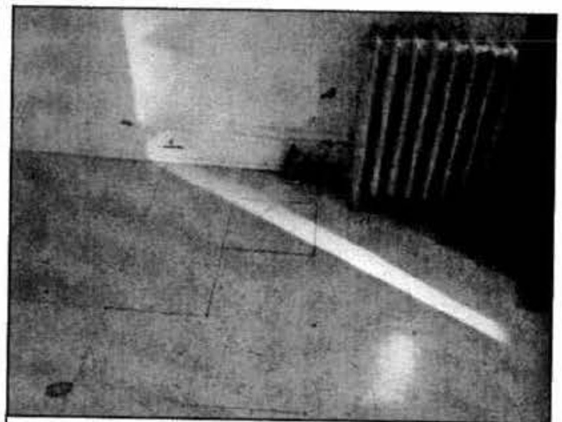


Figure F-51. Dining Room, floor and wall damage

Figure F-52. Dining Room

BEST AVAILABLE COPY

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

Industrial Hygiene Survey

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

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Towson (old) Readiness Center** **307 Washington Avenue** **Towson, MD 21204-4765**
Prepared By:	**Analytical Laboratory Services, Inc.** **3544 North Progress Avenue** **Suite 100** **Harrisburg, PA 17110**
Survey Date:	**June 10, 2010**
Report Date:	**July 22, 2010**
ALSI Project #:	**1006344**

Non-Responsive
[redacted]

Director, Environmental Health & Safety

Table of Contents

BEST AVAILABLE COPY

Section 1.0 Executive Summary

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

1. Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft^2 in the following locations:

    a. Drill Hall Conference Room – Top of Storage Container;
    b. 1st Floor Classroom – Table (Note: rifles cleaned in this location);
    c. 2nd Floor Gym/Weight Room – Window Sill

    Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2.

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

3. Lighting within the facility was evaluated. Lighting levels met the minimum recommended guidelines in all but three areas: 1) Kitchen, 2) Weight Room, & 3) Garage. Lighting should be improved in these areas.

4. Indoor air quality parameters of temperature, relative humidity carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment. Relative humidity exceeded the recommended ceiling of 60% and temperature exceeded the recommended criteria of 79 degrees F in some indoor locations. There is no central air conditioning system in this building. Outdoor conditions were hot and humid. Relative humidity should be maintained at 30-60%. Low relative humidity can lead to the drying of mucous tissues and an increased susceptibility to respiratory infection. High relative humidity can provide an environment suitable for microbial growth and proliferation. For comfort, temperature levels should be maintained between 73-79 degrees F. Carbon dioxide and carbon monoxide levels were within parameters established by the Environmental Protection Agency (EPA) and American Society of Heating, Refrigerating, and Air-conditioning Engineers, Inc. (ASHRAE).

5. 9" by 9" floor tile in the supply office was damaged and in poor condition. This could be a potential source of asbestos fiber release and should be professionally abated.

BEST AVAILABLE COPY

Section 2.0 Operation Description & Observations

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

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

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

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

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

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

BEST AVAILABLE COPY

Section 3.0 Noise Survey

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

BEST AVAILABLE COPY

Section 4.0 Lead Testing

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

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

Lead Testing Results Summary

Sample #	Location	Air ug/m³	Surface ug/ft²	Paint Chip %Pb
1	Assembly/Drill Hall – Window Sill		<110	
2	Kitchen Prep Table		<110	
3	Supply Room Office – AC Supply		<110	
4	Drill Hall Entryway – Bookshelf		<110	
5	Drill Hall Conference Room – Top of Storage Container		**1,100**	
6	Firing Range – Light Fixture		<110	
7	Firing Range – Stored Items		<110	
8	Firing Range – Floor		<110	
9	Outside Firing Range – Floor		<110	
10	1st Floor Classroom – Table		**240**	
11	2nd Floor Army Club – Bar Table		<110	
12	2nd Floor Gym/Weight Room Window Sill		**1,300**	
17	Blank		<12 ug	
13	2nd Floor Room 207 – Peeling Paint on Ceiling			0.074
14	Drill Hall	Void		
15	Firing Range	<4.1		
16	Blank	<3 ug		
Criteria		**50**	**200**	**0.5**

Key: **Bolded** results exceed listed criteria

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

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

The National Guard Bureau currently utilizes 200 ug/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 at various locations throughout the facility. Delaminated paint was mostly due to age along with prolonged exposure to elevated relative humidity levels. A paint chip sample was collected from the 2nd Floor Room 207. Low levels of lead were detected in the sample collected. However, the result was less than the HUD definition of lead-based paint (0.5%).

Housekeeping and cleaning activities should be improved to maintain surface lead dust concentrations below 200 ug/ft^2. Emphasis should be placed on the 1st floor classroom area where it was reported that rifle cleaning is performed. Deteriorated and peeling paint should be properly remediated and repaired.

BEST AVAILABLE COPY

Section 5.0 Lighting

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

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Conference Room	98	30-50	Yes
1st Sergeant Office	80	30-50	Yes
Readiness/NCO Office	49	30-50	Yes
Old Firing Range (Storage)	43	30	Yes
Latrine (1st Floor)	26	5	Yes
Drill Floor	33	30-50	Yes
Kitchen	**35**	50	No
1st Floor Storage	64.5	30	Yes
1st Floor Classroom	54.2	30-50	Yes
Exercise/Weight Room	**15**	30	No
PSG Office	40.7	30-50	Yes
Office 208	91.9	30-50	Yes
Room 207	87.4	30-50	Yes
Garage	**12.9**	75	No

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

BEST AVAILABLE COPY

Section 6.0 Indoor Air Quality

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

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

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 75.1 to 80.6 degrees F with relative humidity readings ranging from 47% to 63%. During the survey, carbon dioxide (CO_2) levels ranged from 412 ppm to 632 ppm within the facility compared to an outdoor CO_2 level of 390 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,090 ppm (390 ppm + 700 ppm). The results of the testing met the ASHRAE guidelines. The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Conference Room	76.8	53	563	0
First Sergeant Office	76.6	59.4	508	0
Readiness/NCO	75.1	47	562	0
Old Firing Range (Storage)	76.6	**64**	596	0
Latrine	76.8	**63**	468	0
Drill Floor	**79.4**	57.7	632	0.1
Kitchen	78.2	56.7	454	0
1st Floor Storage	78	58.9	426	0
1st Floor Classroom	78	**60.4**	438	0
2nd Floor Gym	**79.7**	54.6	412	0.2
PSG Office	**80**	55.5	432	0
Office 208	**80.2**	55.7	436	0
Room 207 - Sleep Quarters	**80.6**	54.1	493	0
Garage	78.2	**60.6**	438	0.1
Outdoors	**84.2**	43	390	0
Criteria	**73.0-79.0**	**30-60**	**<1,090**	**<9.0**

Key: **Bolded** results exceed listed criteria

Relative humidity exceeded the recommended ceiling of 60% and temperature exceeded the recommended criteria of 79 degrees F in some locations. There is no central air conditioning system in this building. Outdoor conditions were hot and humid. Relative humidity should be maintained at 30-60%. Low relative humidity can lead to the drying of mucous tissues and an increased susceptibility to respiratory infection. High relative humidity can provide an environment suitable for microbial growth and proliferation.

A visual inspection was conducted throughout visually accessible portions of the facility. The visual inspection was conducted to assess sources or pathways of factors potentially deleterious to IAQ. The visual inspection revealed the following items that may be potential sources of poor IAQ:

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

2. No areas of fungal growth were observed.

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

BEST AVAILABLE COPY

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

1. 9" x 9" vinyl floor tile and mastic in various locations throughout the 1st and 2nd floor. Approximately 3,500 ft^2 was observed. However, more could be present in hidden areas. Most of this material was in good condition. However, the floor tile in the supply office was damaged and in poor condition. This could be a potential source of asbestos fiber release and should be professionally abated.

2. 12" x 12" vinyl floor tile and mastic. Approximately 200 ft^2 of tile was observed. It is in good condition.

3. The boiler room was inspected. It appeared that all asbestos-containing materials were abated.

BEST AVAILABLE COPY

Section 8.0 Maintenance Bay

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

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

BEST AVAILABLE COPY

Section 9.0 Ventilation Assessment

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

Section 10.0 Limitations

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

This report is intended for the exclusive use of the client. This report and the findings 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.

BEST AVAILABLE COPY

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:**	Old Towson Armory	**Chain Of Custody:**	508093		
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Towson, MD	**Date Submitted:**	6/15/2010		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	NGB-IHNE	**Date Analyzed:**	6/22/2010	**Report Date:**	6/28/2010
Attention:	[redacted]			**Revision Number:**	1	**Revised Date:**	6/28/2010

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
1053523	1006344-11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1053524	1006344-12	Flame	Wipe	****	0.108	110	ug/ft²	130	1300	ug/ft²	
1053525	1006344-17	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
1053526	1006344-13	Flame	Paint Chip	****	N/A	0.008	%Pb		0.074	%Pb	

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)

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.

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

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

Air and Wipe results are not corrected for any blank results

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

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

Analyst: [redacted] Non-Responsive

Technical Manager: [redacted] Non-Responsive

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

AIHA LAP, LLC ACCREDITED LABORATORY

LAB #100470

NY ELAP 10920

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	Old Towson Armory	**Chain Of Custody:**	508093		
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Towson, MD	**Date Submitted:**	6/15/2010		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	NGB-JHNE	**Date Analyzed:**	6/22/2010	**Report Date:**	6/28/2010
Attention:	[redacted]			**Revision Number:**	1	**Revised Date:**	6/28/2010

Page 1 of 2

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
1053510	1006344-14	Flame	Air	621	N/A	4.8	ug/m^3	<3	<4.8	ug/m^3	This air sample was submitted on a filter other than MCE. MDLs and resulting Reporting Limits were derived using MCE filters. The results of these analyses are not recognized under our AIHA accreditation.
1053511	1006344-15	Flame	Air	727	N/A	4.1	ug/m^3	<3	<4.1	ug/m^3	
1053512	1006344-16	Flame	Air Blank	0	N/A	3	ug/m^3		<3	ug	
1053513	1006344-1	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053514	1006344-2	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053515	1006344-3	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053516	1006344-4	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053517	1006344-5	Flame	Wipe	****	0.108	110	ug/ft^2	120	1100	ug/ft^2	
1053518	1006344-6	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053519	1006344-7	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053520	1006344-8	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053521	1006344-9	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1053522	1006344-10	Flame	Wipe	****	0.108	110	ug/ft^2	26	240	ug/ft^2	

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

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) **508093**

PVa

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: Old Towson Armory
2. Job Location: Towson, MD
3. Job #: Old Towson Armory P.O. #: ~~W912K6-09-A-0003~~ NGB - IHNE
4. Contact Perso[redacted] @ phone #: (410) 942-0273
5. Submitted by:[redacted]

Reporting Information (Results will be provided [redacted] 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: 6/22/10	☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ Include COC/Field Data Sheets with Report ☒ [redacted]@analyticallab.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 PCM __ (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	SPORE TRAP	TAPE	SWAB
1006344-1	Assembly - WS	6/10		100cm²				X				X				
1006344-2	Kit. Prep Table							X				X				
1006344-3	Supply Rm Off.							X				X				
1006344-4	Drill Hall Bskt							X				X				
1006344-5	Drill Hall Conf Rm							X				X				
1006344-6	Firing Rng - Dust Exh.							X				X				
1006344-7	Firing Rng - Shooting Stand							X				X				
1006344-8	Firing Rng - Fl							X				X				
1006344-9	Outside Rng - Fl							X				X				
1006344-10	1st Fl Classroom Table							X				X				
1006344-11	2nd Fl Army Club Table							X				X				
1006344-12	2nd Fl Gym WS							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: 6/16/10 @ 1030 Via: UPS By (Print): [signature] Sign: [signature]
2. Date/Time Analyzed: __/__/__ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: all above Via: e mail Date: 6/22/10 Time: 1210 Initials: CW
4. Comments:

BEST AVAILABLE COPY

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) 509093 pd/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: Old Towson Armory
2. Job Location: Towson, MD
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Perso[redacted] @ phone # (410) 942-0273
5. Submitted by: Signature:

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

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due:	☐ Immediate ☐ 3 Day	☒ Include COC/Field Data Sheets with Report
☐ 24 Hours Time Due:	☐ Next Day ☐ 5 Day +	☒ Email: [redacted] @us.army.mil
Comments:	☐ 2 Day Date Due: ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☐ Fax: ☐ 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 Trap/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	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	AIR	MATRIX: BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
1006344-13	2nd Fl Rm 207	6-10						X			X						Date/Time: Contact: By:
1006344-14	Drill Hall		681					X		X							
1006344-15	Old Firing Range		787					X		X							
1006344-16	Blank		0					X		X							
1006344-17	Blank	↓		0				X				X					Date/Time: Contact: By:
																	Date/Time: Contact: By:

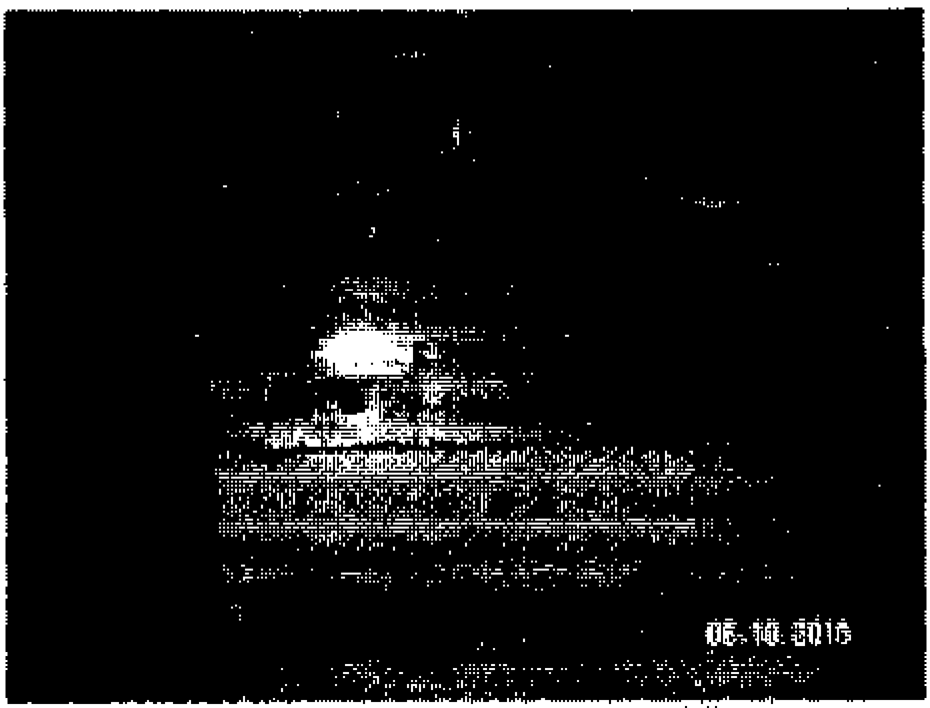
LABORATORY STAFF ONLY: (CUSTODY)

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

BEST AVAILABLE COPY

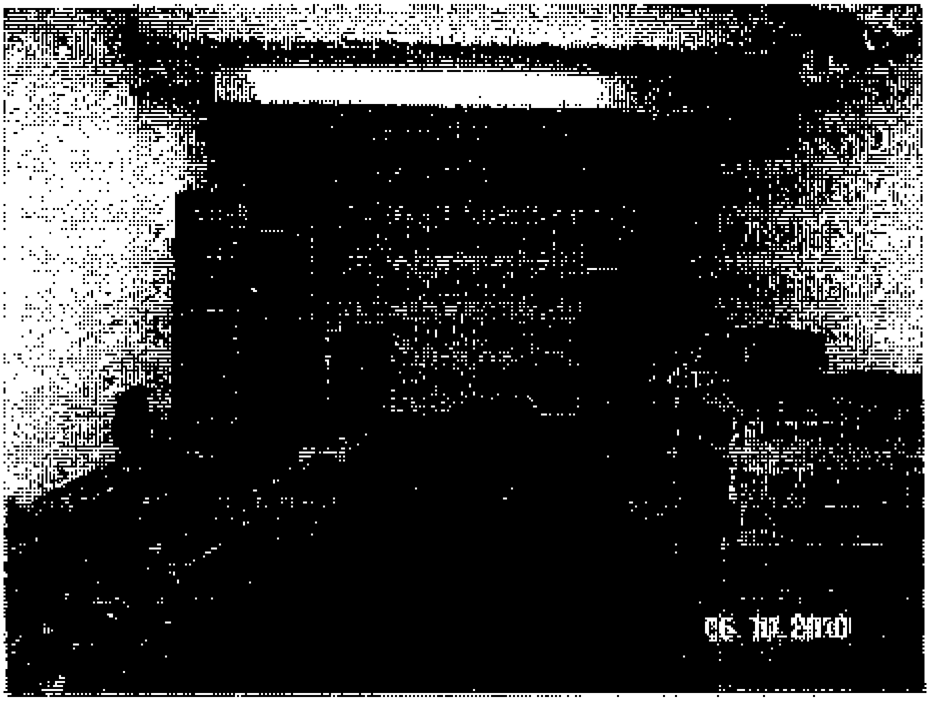
Appendix B, Photographs

BEST AVAILABLE COPY

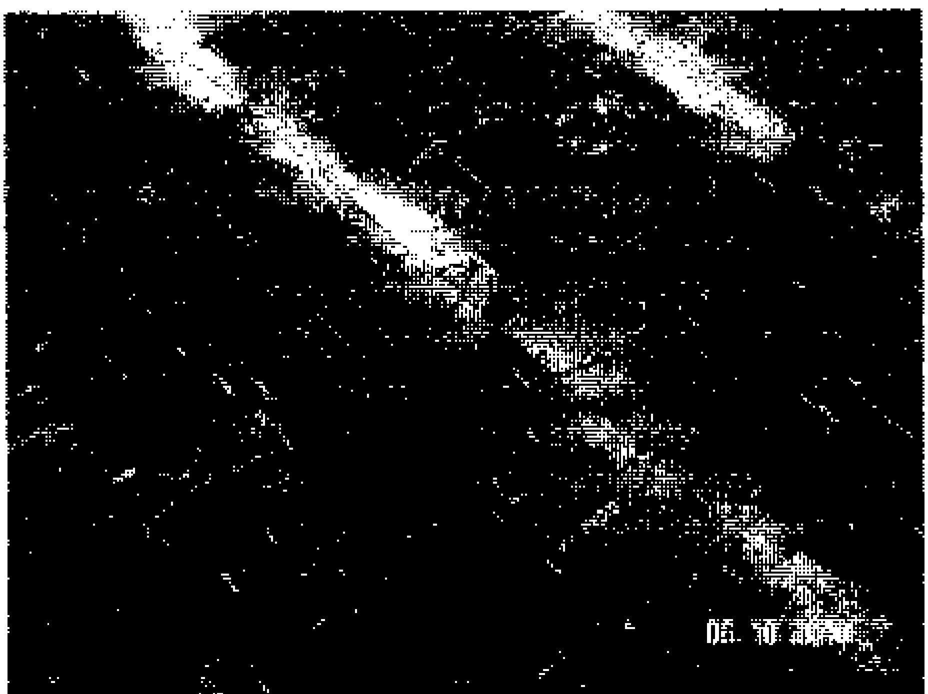


Damaged 9'X9' Floor Tile in Supply Office.

BEST AVAILABLE COPY

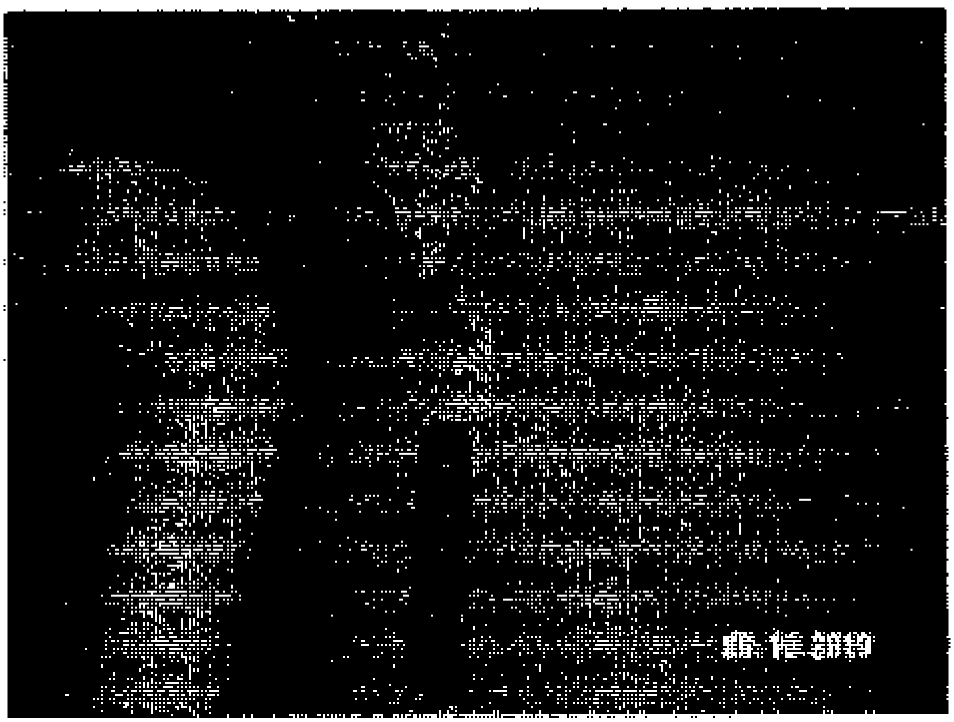


Firing Range.

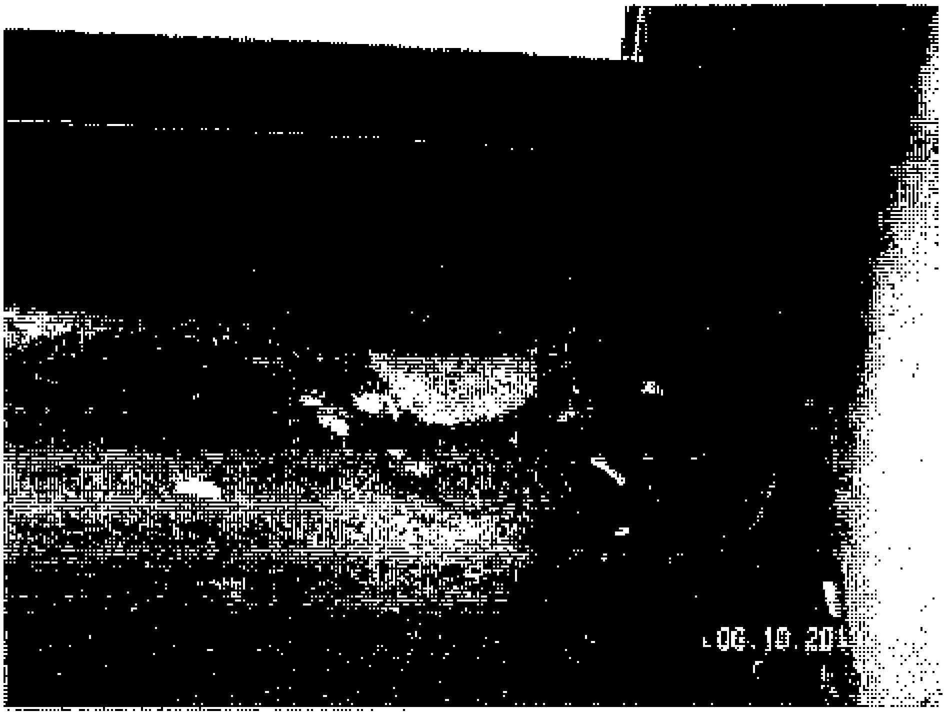


Most Common 9"X9" Floor Tile in Facility.

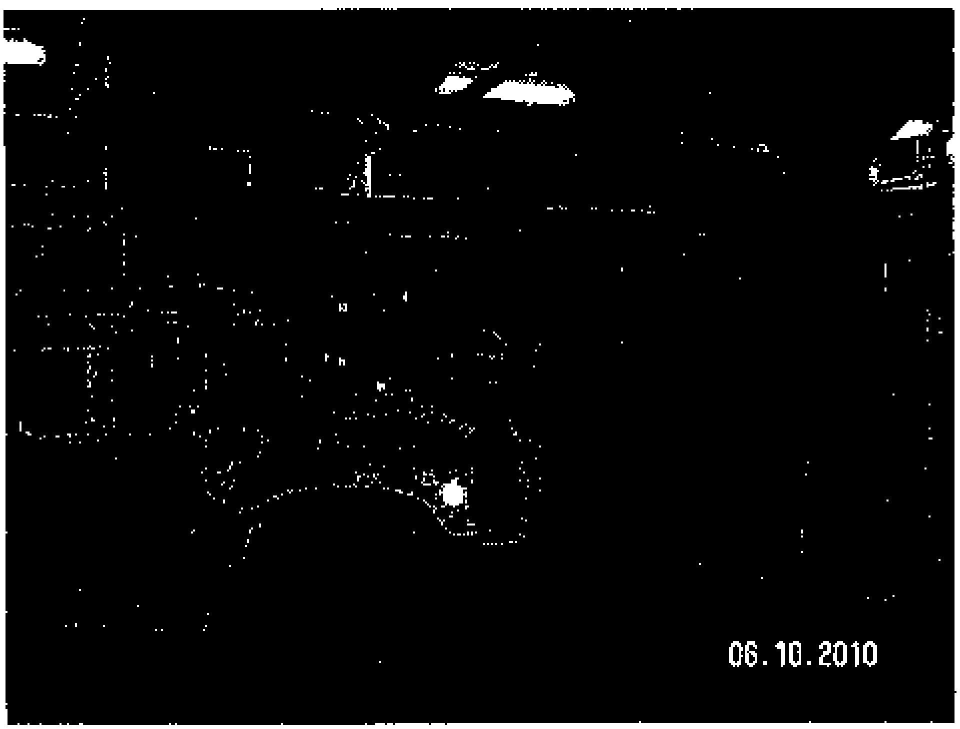
Sleeping Quarts, Peeling Paint.



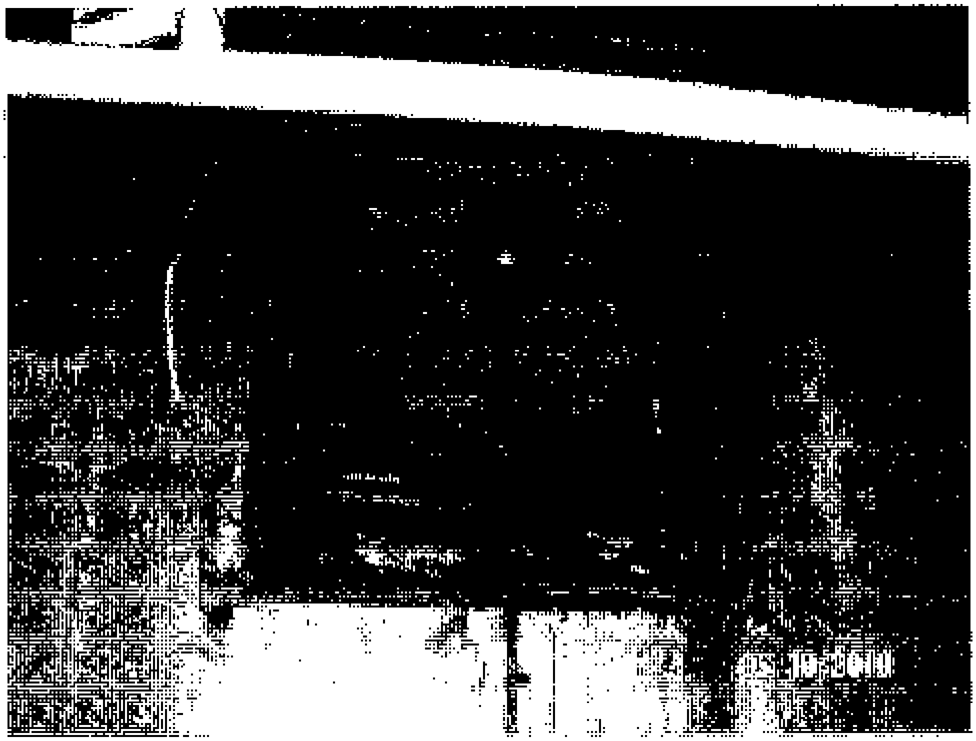
Room 208. Peeling Paint.



Gym, Peeling Paint



Garage/Storage Area

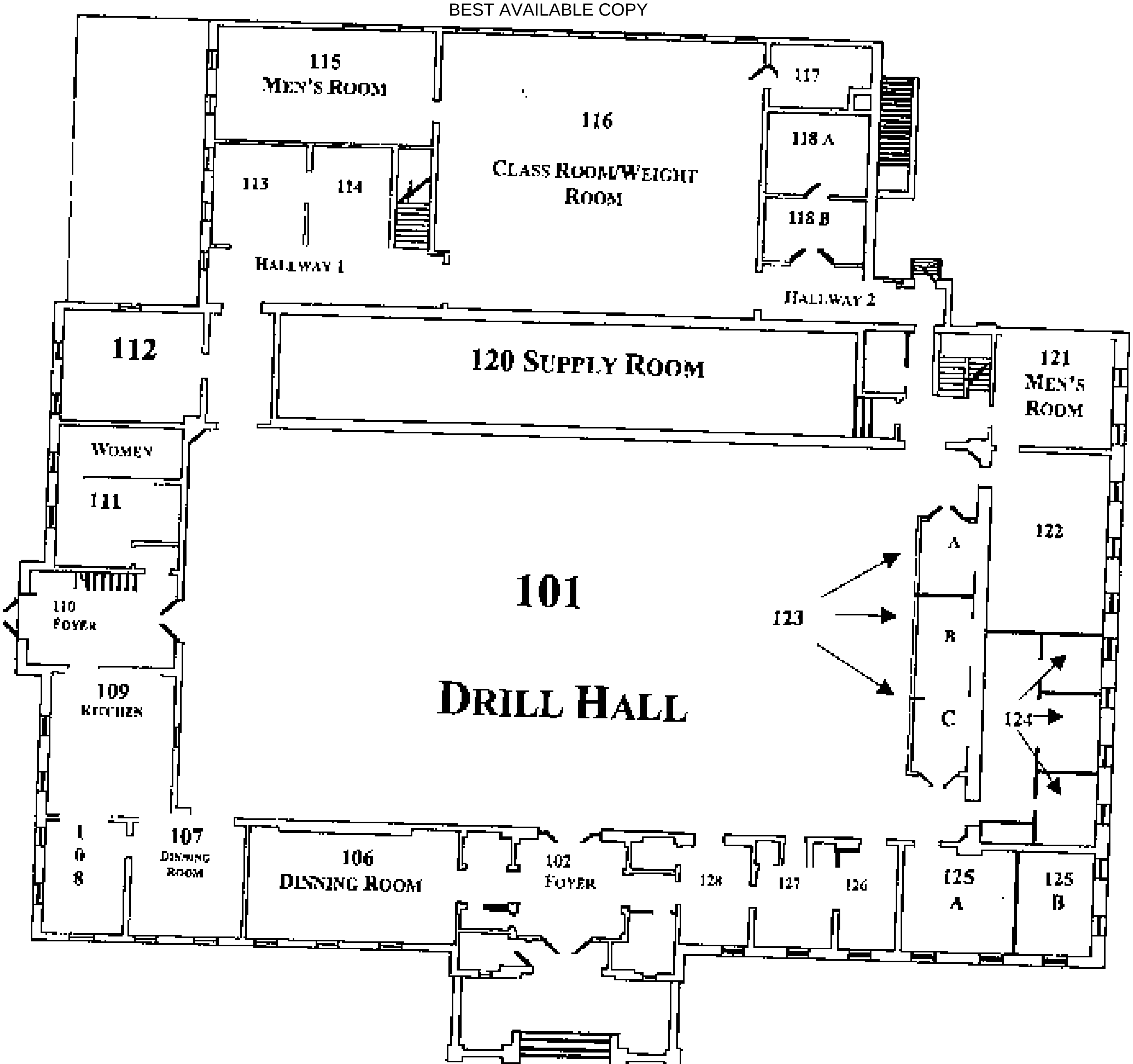


Garage/Storage Area. Exhaust Fan. Does Not Work.

BEST AVAILABLE COPY

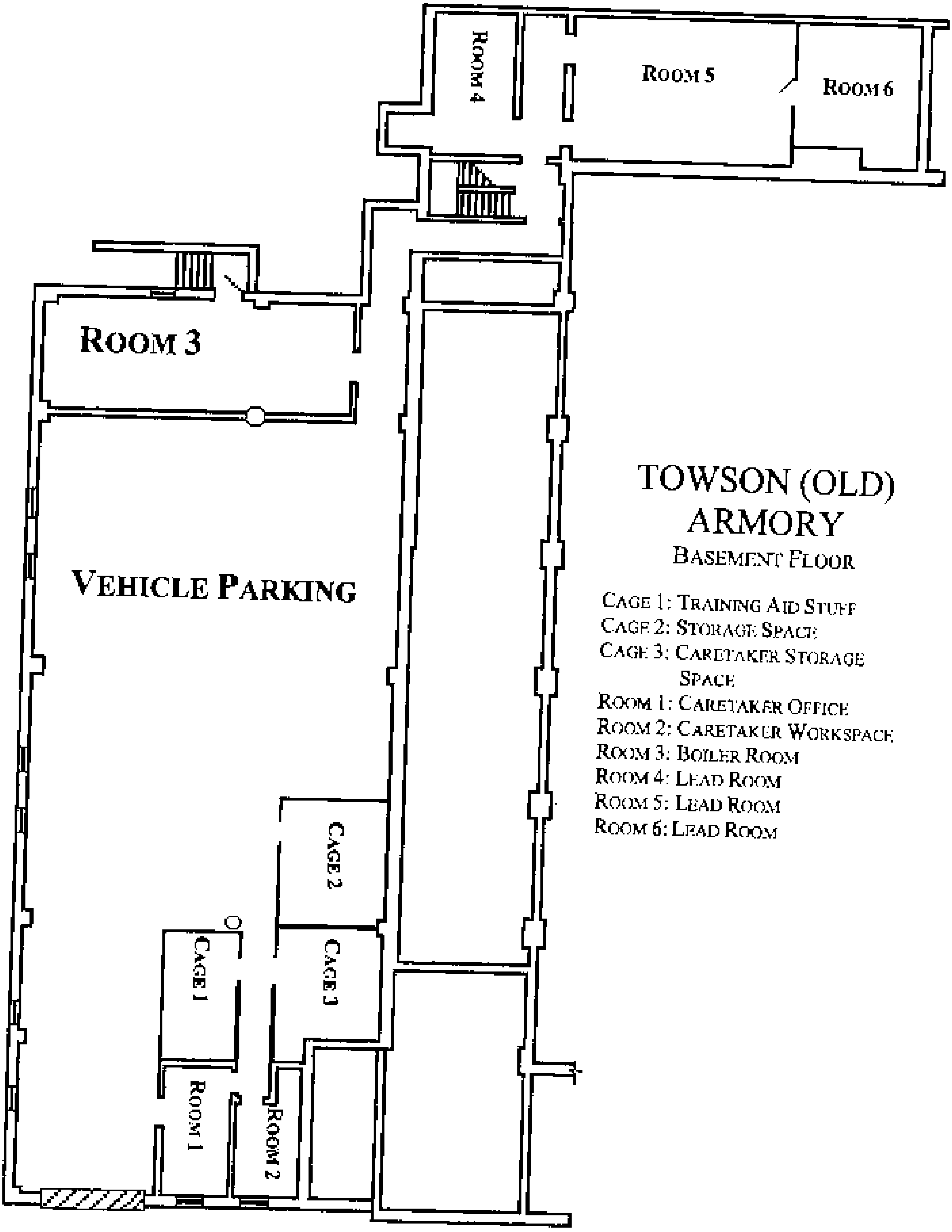
Appendix C. Floor Plan

BEST AVAILABLE COPY



TOWSON (OLD) ARMORY
FIRST FLOOR

101	DRILL HALL
102	FRONT FOYER
103	FRONT OUT SIDE STORAGE
104	FRONT INDOOR STORAGE (LEFT SIDE)
105	FRONT INDOOR STORAGE (LEFT SIDE)
106	DINNING ROOM
107	DINNING ROOM
108	FOOD SERVING AREA
109	KITCHEN
110	SIDE FOYER
110 A	SIDE STORAGE
111	WOMEN'S ROOM
112	
113	ANTI ARMORS ROOM
114	NBC ROOM
115	MEN'S ROOM
116	CLASS/WEIGHT ROOM
117	NVG ROOM
118 A & B	ARMS ROOM
119	TM LIBRARY ROOM
120	SUPPLY ROOM
121	MEN'S ROOM
122	COMPANY ORDERLY ROOM
123 A	
123 B	COMPANY MEDIC
123 C	
124	STATE GUARD
125 A	STATE GUARD
125 B	STATE GUARD
126	
127	RECRUITING OFFICE
128	CARE TAKERS OFFICE
128 A	STORAGE ROOM
129	MEN'S ROOM
H	HANDICAP BATHROOM

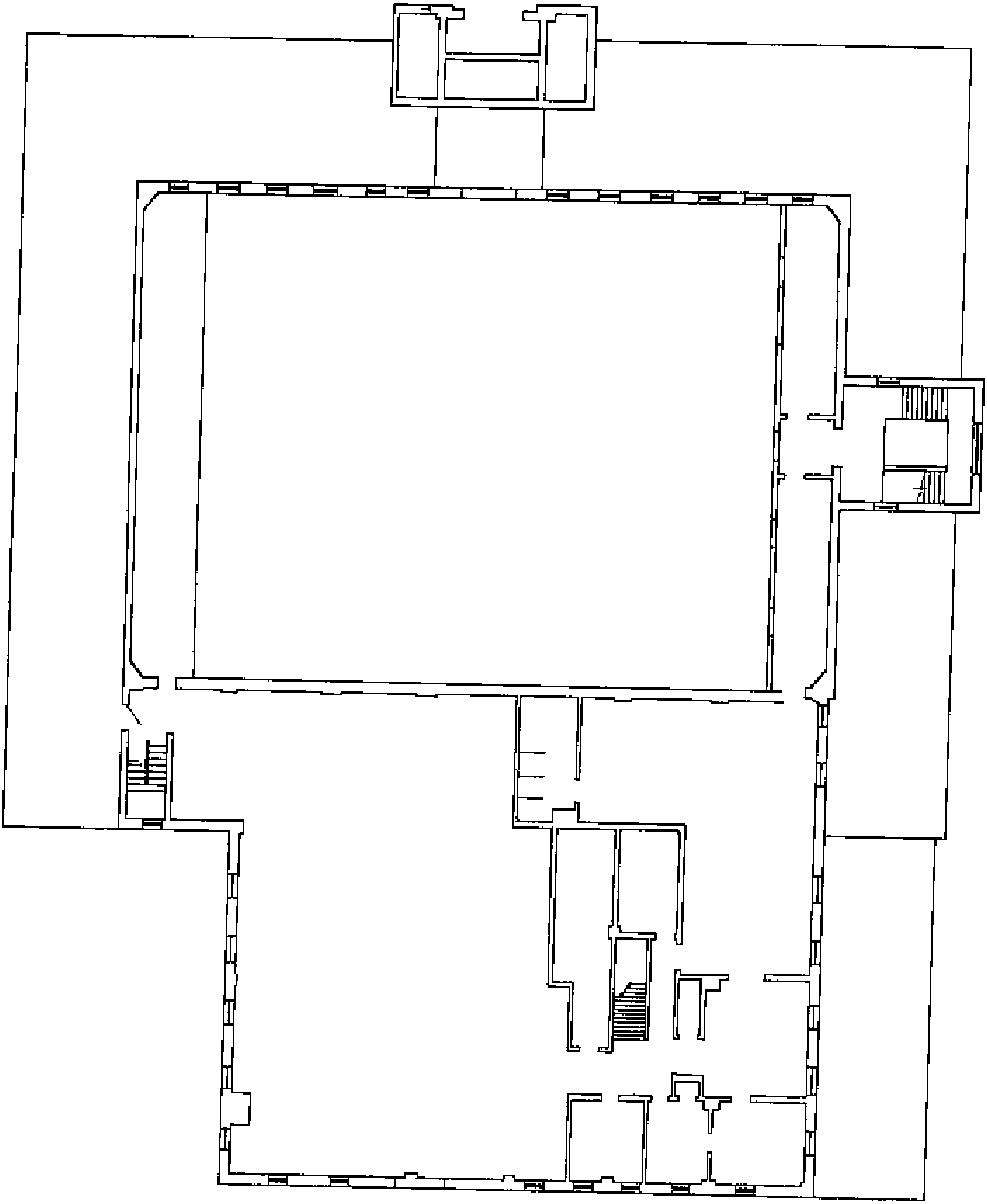


TOWSON (OLD) ARMORY

BASEMENT FLOOR

CAGE 1: TRAINING AID STUFF
CAGE 2: STORAGE SPACE
CAGE 3: CARETAKER STORAGE SPACE
ROOM 1: CARETAKER OFFICE
ROOM 2: CARETAKER WORKSPACE
ROOM 3: BOILER ROOM
ROOM 4: LEAD ROOM
ROOM 5: LEAD ROOM
ROOM 6: LEAD ROOM

BEST AVAILABLE COPY



BEST AVAILABLE COPY

Appendix D. References

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

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

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

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

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

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

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

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

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

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

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

07 MAR 2005

MCHB-TS-OFS

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

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03/05, MG Henry C. Evans Armory, Westminster, MD

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

2. The project number for this service reflects the current fiscal year of dispatch and the actual field work which was completed for fiscal year 2003. The State of Maryland Army National Guard occupational health nurse was immediately notified in writing of findings necessitating immediate corrective action in Maryland armories. In addition, the National Guard Bureau Region North Industrial Hygiene office has been notified of all the results of lead in dust sampling conducted in all facilities. Draft reports were reviewed by you or other members of the National Guard and members of this Center, including our editorial staff, during drafting stages in report preparation leading up to the final report.

3. Some of the original color photographs may be hole-punched because the document was originally submitted in a notebook

4. Our point of contact is Ms. [redacted] at commercial (410) 436-5475/3118, DSN 584-5475/3118, or by e-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

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

Approved for public release; distribution unlimited

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

USACHPPM

CONSERVARE SALUTEM

Readiness Thru Health

BEST AVAILABLE COPY

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)*

BEST AVAILABLE COPY

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

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

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

2. CONCLUSIONS.

a. Lead. All air samples were below the laboratory reporting limit for lead in air of 6 µg/m³ and the Occupational Health and Safety Administration (OSHA) standard of 50 µg/m³ for lead in air. Two samples were above the Environmental Protection Agency (EPA) and State of Maryland lead exposure levels for children of 40 µg/ft² on floors. One of six surface wipe samples was above the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) and National Guard Bureau Region North recommended decontamination level of 200 µg/ft² for floors and other frequently contacted surfaces. This surface wipe sample was collected in the bullet trap area of the former converted indoor firing range, and the result was very high (1,364 µg/ft²). Personnel who work in this room are potentially exposed to high levels of lead, and are tracking lead out of the area and redistributing lead into adjacent rooms in the armory. This can result in lead exposures to children and to the general workforce. Army Regulation 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them.

b. Safety hazards. The air conditioning units pose a potential safety hazard to young children. The chain on the drill floor garage door poses a potential safety hazard to people entering the area.

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

a. Lead. The RAC for lead exposure in the former indoor firing range (IFR) area is classified as 4. Clean all areas in and adjacent to the former IFR where sampling results showed elevated levels of lead. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. Apply a sealant to the area. Recleaning and sealing the IFR may further prevent lead from becoming redistributed into adjacent rooms and resulting in exposures for children and for the general workforce. Recleaning all additional areas that showed high dust-lead levels may further prevent exposures for children and for the general workforce. Address all potential lead hazards before extending this facility to use for children. If children will be using this facility, clean surfaces to the EPA dust-lead standard for young children of 40 $\mu g/ft^2$ on floors and clean to the USACHPPM decontamination level of 200 $\mu g/ft^2$ for dust-lead on all other surfaces. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities. These workers are required to be in compliance with the OSHA Lead in Construction Standard, Title 29 Code of Federal Regulations Part 1926.62. There is a potential for personnel taking lead contamination out of the workplace into their vehicles and homes. Wear disposable gloves and disposable coveralls as extra protection when working in areas identified as having elevated levels of lead.

b. Safety Hazards. Address safety hazards posed by air conditioning units and the chain on the drill floor garage.

BEST AVAILABLE COPY

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

TABLE OF CONTENTS

Paragraph Page

Enclosure

Appendices

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

MCHB-TS-OFS

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

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

1. AUTHORITY. Email, MD Army National Guard (ARNG), Ms. [redacted], 28 February 2003, subject: SAB

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

3. BACKGROUND INFORMATION.

a. Armory Mission. Artillery.

b. Date of Construction. 1980.

c. Facility Use by Children. The point of contact stated that there is potential use by children if the armory is rented.

4. SUMMARY OF ACTIONS.

a. Sampling. Surface dust-lead wipe and air sampling was conducted to determine the existence of lead hazards. Sample locations are in Appendix D.

b. Physical Condition of Facilities.

Readiness thru Health
Printed on Recycled Paper

(1) Paint. There is no deteriorated paint in the armory. We believe that lead-based paint was never applied to the walls in the armory. The Army stopped using lead-based paint in facilities in 1978.

(2) Asbestos. There are no records for asbestos containing materials in this armory.

(3) Mold. No mold was observed.

(4) Safety Hazards. The air conditioning unit cases have to be pulled off in order to operate them. This presents a potential safety hazard of children putting their fingers into the fan. The chain on the drill floor garage can be cumbersome to operate and there is a potential for the door to drop onto people underneath.

c. Other Building Concerns. There were no other building concerns observed.

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

e. Heating, Ventilation, and Air-conditioning System. Ventilation and air conditioning are provided mainly by window-mounted air conditioning units and the manual operation of windows when the building is not being heated. Heating is supplied by a gas boiler system.

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

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

h. Converted indoor firing range (IFR). The former IFR is now being used as a garage that contains vehicles and a tractor, plus supplies.

5. ASSESSMENT CRITERIA. See Appendix A.

6. SAMPLING RESULTS. Lead in air and surface wipe sample results are in Appendix D. Two results were above the Environmental Protection Agency (EPA) lead exposure levels for children of 40 $\mu g/ft^2$ on floors. One of six surface wipe sample results was above the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) and National Guard Bureau (NGB) Region North recommended decontamination level of 200 $\mu g/ft^2$ for floors and other frequently contacted surfaces. One dust-lead level in the former IFR was very high. All air samples were below the laboratory reporting limit for lead in air of 6 $\mu g/m^3$ as well as the Occupational Health and Safety Administration (OSHA) standard of 50 $\mu g/m^3$ for lead in air.

BEST AVAILABLE COPY

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

See Table 1 for dust-lead wipe sample locations, photograph numbers, and analytical results. All sample results that are equal to or exceed 40 µg/ft² are highlighted. Samples that are below the laboratory reporting limit are designated as <RL.

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

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

7. DISCUSSION AND CONCLUSIONS.

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

b. All air sample results were below the laboratory reporting limit for lead in air of 6 µg/m³ as well as the OSHA standard of 50 µg/m³ for lead in air.

c. One of six surface wipe samples exceeded the USACHPPM and NGB Region North recommended decontamination level of 200 µg/ft² for floors and other frequently contacted surfaces. This elevated surface wipe sample was collected in the bullet trap area of the former converted indoor firing range. The lead level was very high (1,364 µg/ft²) (photo # 1412). One additional wipe was located one foot away from the door entrance to the former IFR and exceeded the EPA lead exposure levels for children of 40 µg/ft²on floors (photo # 1414).

d. Personnel responsible for the storage in this room are potentially exposed to very high levels of lead, and are tracking lead out of the area and redistributing lead into adjacent rooms in the armory. This can result in lead exposures for children and for the general workforce.

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

f. The air conditioning units pose a potential hazard to young children. The chain on the drill floor garage poses a potential hazard to people in the area.

BEST AVAILABLE COPY

8. RECOMMENDATIONS. See Enclosure.

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

[redacted], M.S.
Industrial Hygienist
USACHPPM Lead and Asbestos Team Leader
Industrial Hygiene Field Services Program

APPROVED:

[redacted], CIH
Technical Manager
Industrial Hygiene Field Services Program

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

WESTMINSTER ARMORY RECOMMENDATIONS

The Department of Defense Instruction Number (DODI) 6055.1 provides Risk Assessment Codes (RACs) for Health Hazards, a procedure which allows us to assess the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and combines the hazard severity and accident probability into a single numeral. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority. The RAC for Lead Exposure in the former indoor firing range area is classified as 4.

1. Lead Exposure. RAC 4.

a. Clean all areas in and adjacent to the former IFR where sampling results showed elevated levels of lead. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. Apply a sealant to the area. Recleaning and sealing the IFR may further prevent lead from becoming redistributed into adjacent rooms and resulting in exposures for children and for the general workforce. Address all potential lead hazards before extending this facility to use for children. If children will be using this facility, clean surfaces to the EPA dust-lead standard for young children of 40 µg/ft² on floors and clean to the USACHPPM decontamination level of 200 µg/ft² for dust-lead on all other surfaces.

b. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities. These workers are required to be in compliance with the OSHA Lead in Construction Standard, 29 CFR 1926.62.

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

2. Additional Recommendations. Address safety hazards posed by air conditioning units and the chain on the drill floor garage.

APPENDIX A

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE

ASSESSMENT CRITERIA FOR LEAD

BEST AVAILABLE COPY

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

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

c. OSHA cites a level of 200 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.

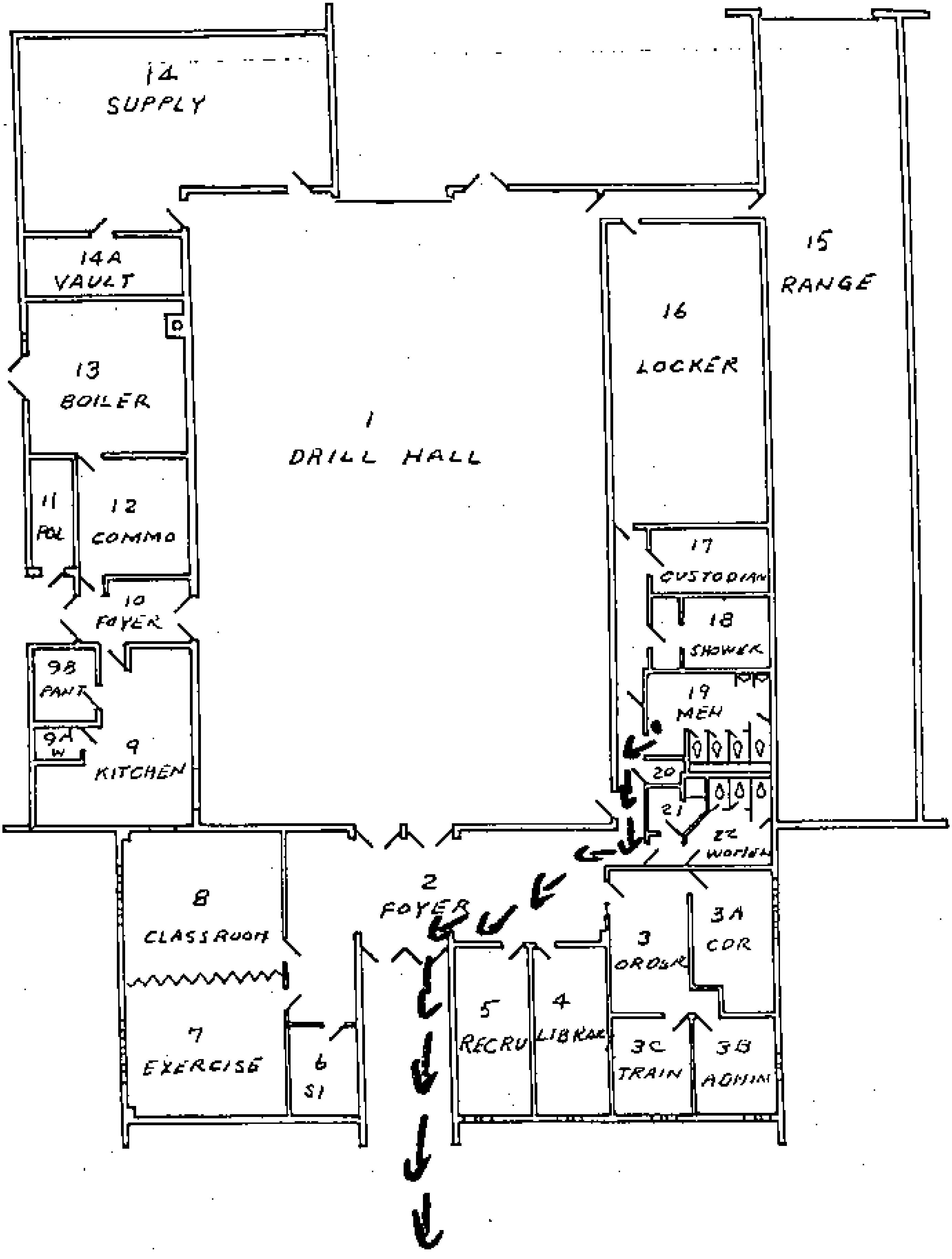
3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 50 µg/m³ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

BEST AVAILABLE COPY

APPENDIX B

SITE MAPS

BEST AVAILABLE COPY



WESTMINSTER ARMORY

NO SCALE

BEST AVAILABLE COPY

APPENDIX C

PHOTOGRAPHS

BEST AVAILABLE COPY

Photographs Showing Lead Paint and Wipe Sample Locations

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

BEST AVAILABLE COPY

BEST AVAILABLE COPY

)001410.JPG Unknown

)001411.JPG Unknown

BEST AVAILABLE COPY

001412.JPG Unknown

P0001414.JPG Unknown

)001415.JPG Unknown

BEST AVAILABLE COPY

)001416.JPG Unknown

APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

BEST AVAILABLE COPY

Westminster Armory Lead Wipe Sample Results

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

DATA CHEM LABORATORIES, INC.

ted To: [redacted]
Commander, USACHPPM
MCHB TS OFS; 5158 Blackhawk Road
APG, MD 21010-5403

nce Data:	**Lead**
:lient Sample No.:	WRBLANK01 through WRAS02
'.O. No.:	Not Available
;ample Location:	Westminister
;ample Type:	Filter
lethod Reference:	NIOSH 7300
)CL Set ID No.:	03-S-3734
)CL Sample ID No.:	03-22924 through 03-22927
;ample Receipt Date:	8/4/2003
'reparation Date:	08/06/03
ınalysis Date:	08/07/03

:he samples were prepared and analyzed in accordance with NIOSH
ı 7300 using a Perkin Elmer 3000XL ICP.

[he sample condition upon receipt was acceptable except where
.

[he results are in the enclosed data table. Results relate only to
:ems tested and are not blank corrected unless indicated in the
:able.

[his report shall not be reproduced except in full, without the
en approval of the laboratory.

[redacted]

Chris Baugues
Analyst

[redacted]

Reviewer

ICINNATI OFFICE
8 GLENDALE-MILFORD ROAD
ICINNATI, OHIO 45242-3706
· 733-5336, FAX 513 733-5347

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

BEST AVAILABLE COPY

Results
Lead

Client #	DCL #	Sample Volume (L)	µg/sample	mg/m^3
WRBLANK01	03-22924	0	ND	-
WRBLANK02	03-22925	0	ND	-
WRAS01	03-22926	174.9	ND	<0.006
WRAS02	03-22927	165.2	ND	<0.006
	Prep Blank		ND	
% Recovery	LCS		99.	
RPL			1.	

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

[redacted]

Chris Baugues
Analyst

[redacted]

Reviewer

BEST AVAILABLE COPY

Reservoirs Environmental, Inc.

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

August 15, 2003

Laboratory Code:	**RES**
Subcontract Number:	**NA**
Laboratory Report:	**RES 96187-1**
Project Description:	**None Given**
	None Given

Non-Responsive [redacted]
USACHPPM
USACHPM, ATTN: MCHB-TS-OFS Bldg 1570
APG MD 21010

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association, Lab ID 101533 - Accreditation Certificate #480. The laboratory is currently proficient in both PAT & ELPAT programs respectively.

Reservoirs has analyzed the following sample(s) using Atomic Emission Spectroscopy - Inductively Coupled Plasma (AES-ICP) per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the analysis table. Results have been sent to your office.

RES 96187-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you should have any questions about this report, please feel free to call me at 303-964-1986.

Sincerely,

Non-Responsive [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 96187-1**
Client:	**USACHPPM**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**None Given**
Date Samples Received:	**August 4, 2003**
Analysis Type:	**USEPA SW846 3050B / AA(7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 11, 2003**

Client ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
CF BLANK01	EM 802204	0.11	BDL	23	BDL
CF W01	EM 802205	0.11	BDL	23	BDL
CF W02	EM 802206	0.11	BDL	23	BDL
CF W03	EM 802207	0.11	BDL	23	BDL
CF W04	EM 802208	0.11	BDL	23	BDL
CF W05	EM 802209	0.11	8.0	23	73
CF BLANK02	EM 802210	0.11	BDL	23	BDL
CF W06	EM 802211	0.11	46.3	23	421
CF W07	EM 802212	0.11	BDL	23	BDL
WR BLANK01	EM 802213	0.11	BDL	23	BDL
WR W01	EM 802214	0.11	BDL	23	BDL
WR W02	EM 802215	0.11	BDL	23	BDL
WR W03	EM 802216	0.11	150.0	23	1364
WR W04	EM 802217	0.11	14.5	23	132
WR W05	EM 802218	0.11	BDL	23	BDL
WR BLANK02	EM 802219	0.11	BDL	23	BDL
WR W06	EM 802220	0.11	BDL	23	BDL
WR W07	EM 802221	0.11	No Sample Submitted In Tube		
EC BLANK01	EM 802222	0.11	BDL	23	BDL
EC W01	EM 802223	0.11	BDL	23	BDL
EC W02	EM 802224	0.11	BDL	23	BDL
EC W03	EM 802225	0.11	2.5	23	23
EC W04	EM 802226	0.11	BDL	23	BDL
EC W05	EM 802227	0.11	BDL	23	BDL
EC BLANK02	EM 802228	0.11	BDL	23	BDL
EC W06	EM 802229	0.11	BDL	23	BDL
EC W07	EM 802230	0.11	BDL	23	BDL
EC W08	EM 802231	0.11	BDL	23	BDL
GA BLANK01	EM 802232	0.11	BDL	23	BDL
GA W01	EM 802233	0.11	2.7	23	25

BDL = Below Detection Limit

Data Qa

APPENDIX E

REFERENCES

BEST AVAILABLE COPY

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) 62-2001, Ventilation for Acceptable Indoor Air Quality.

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

BEST AVAILABLE COPY

APPENDIX F

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

BEST AVAILABLE COPY

CHAPTER 14: CLEANING

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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).

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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.

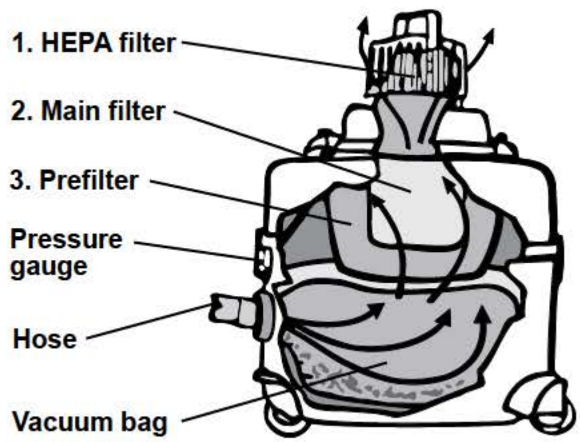
To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture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

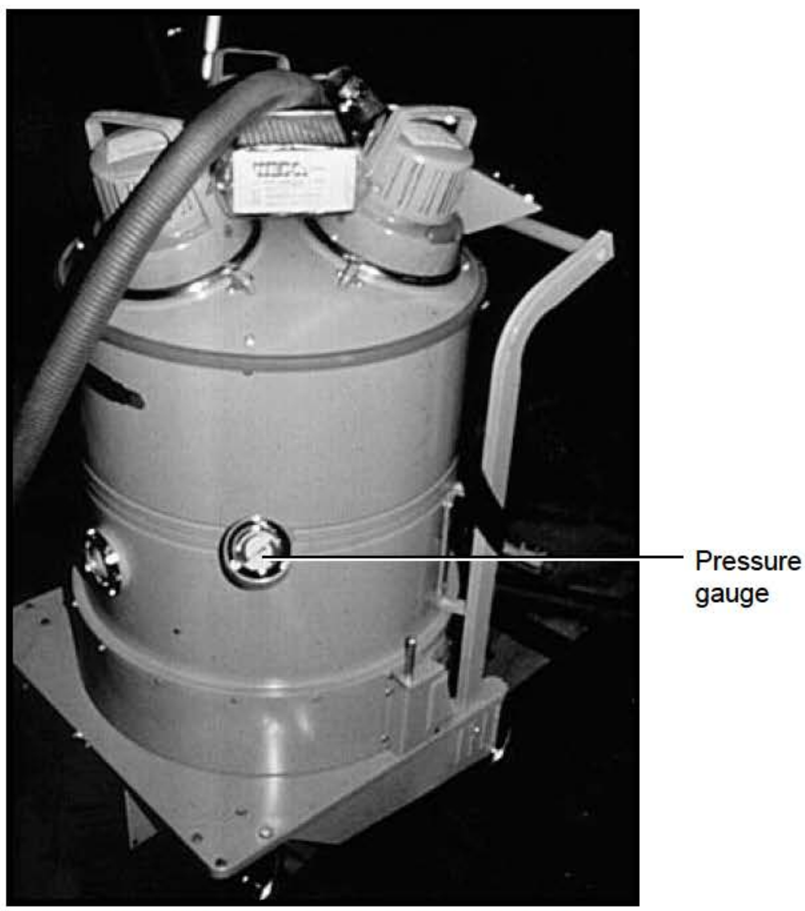
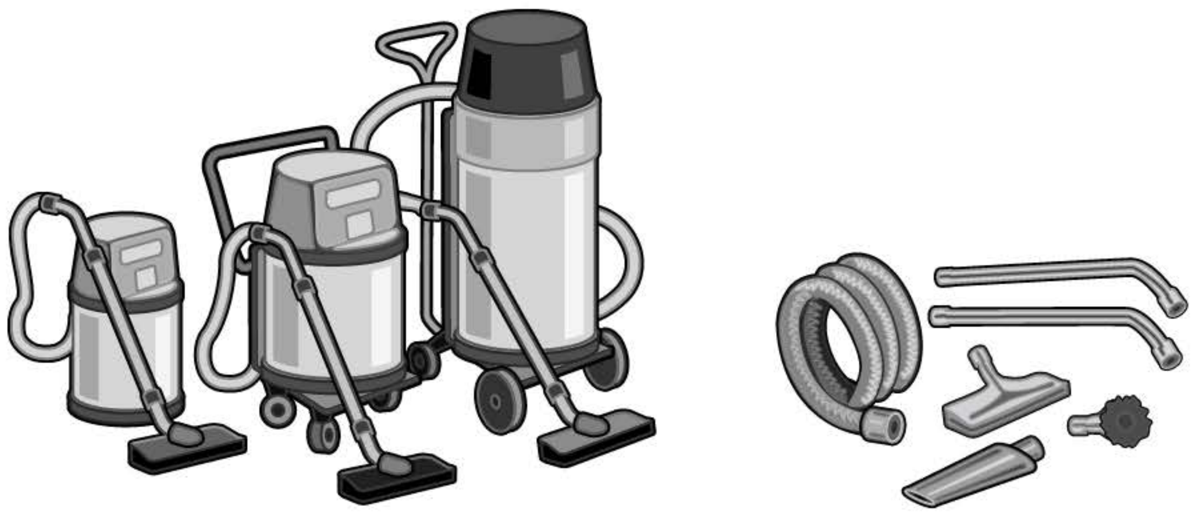


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

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.

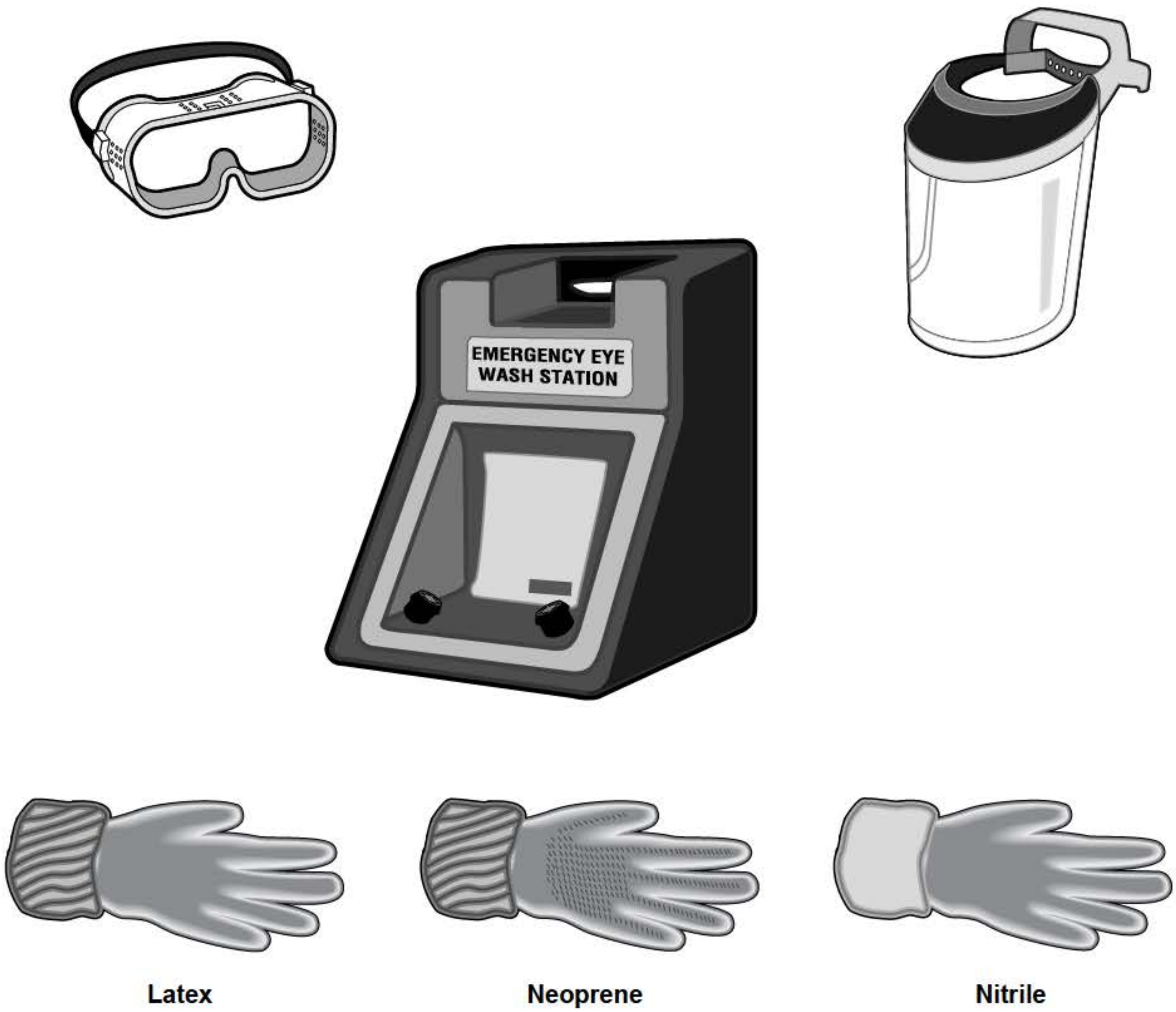
Proper Wet-Cleaning Procedures

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

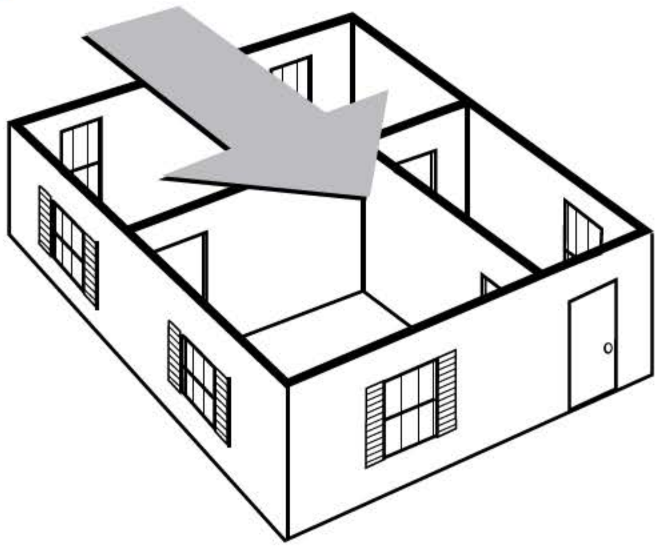
Typical Procedures

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:

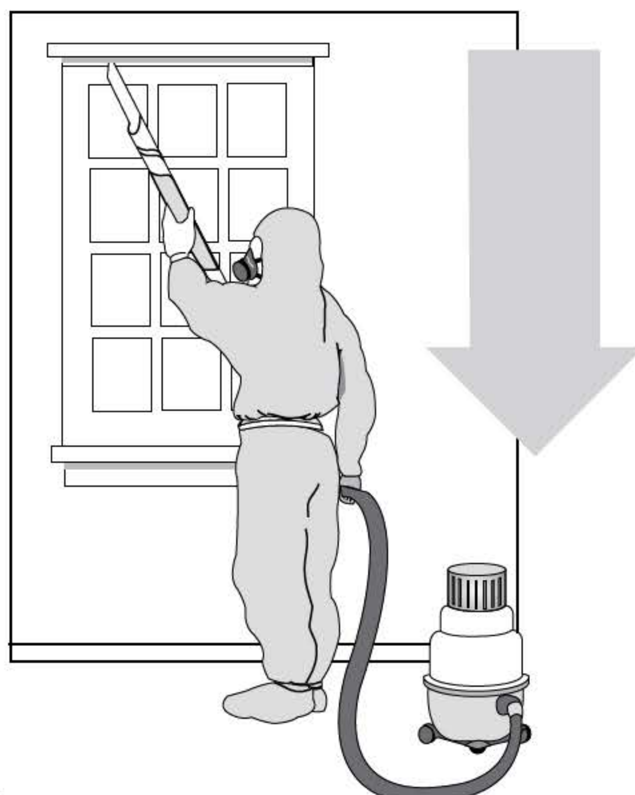
- First, the area is HEPA vacuumed.

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

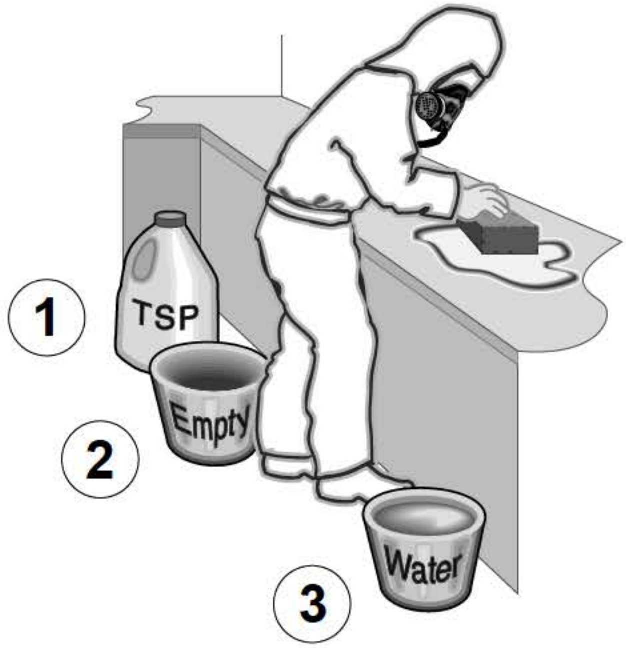
Dust Brush

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

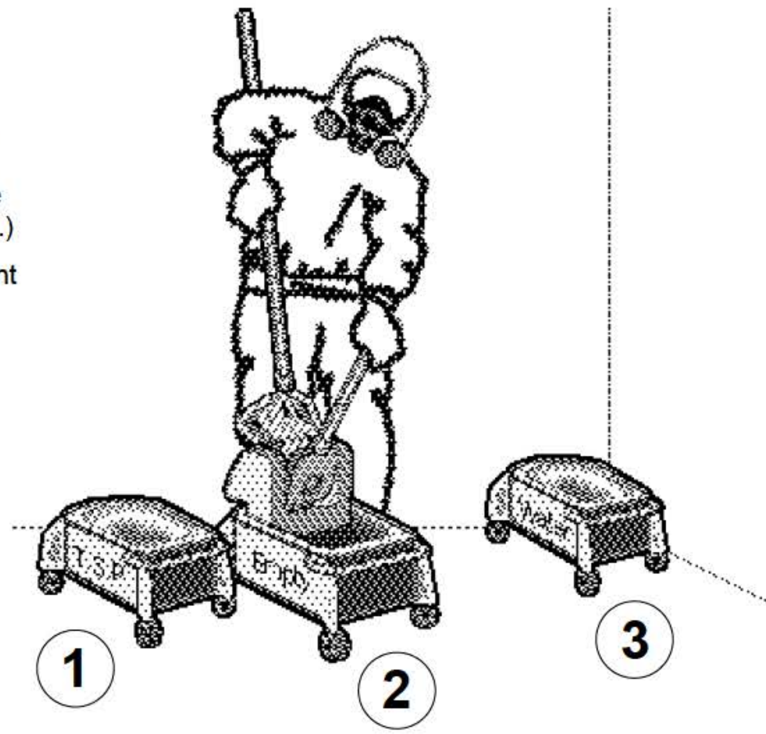
Don't Dry Sweep

Figure 14.4c (continued)

Use the 3-Bucket System.

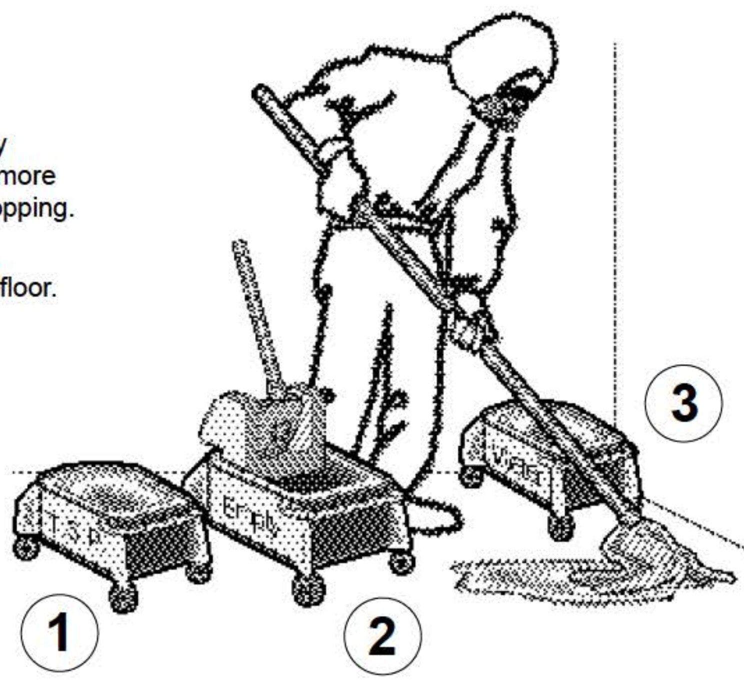
To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

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.

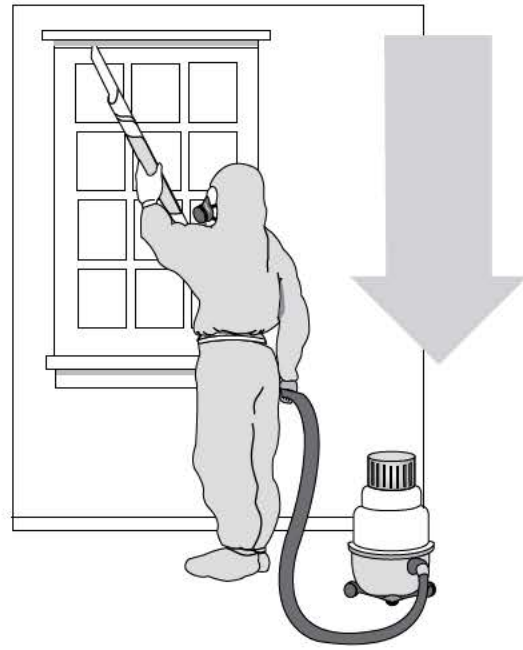


BEST AVAILABLE COPY

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).

BEST AVAILABLE COPY

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

BEST AVAILABLE COPY

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

BEST AVAILABLE COPY

Army Facilities Management Information Document on Mold Remediation Issues

TG 277

FEBRUARY 2002

USACHPPM

Readiness thru Health

CONSERVARE SALUTEM

BEST AVAILABLE COPY

ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

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.

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.

BEST AVAILABLE COPY

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)

BEST AVAILABLE COPY

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.

BEST AVAILABLE COPY

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).

BEST AVAILABLE COPY

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.

Local Reproduction is Authorized and Encouraged.

USACHPPM
CONSERVARE SALUTEM
Readiness thru Health

Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278
February 2002

USACHPPM
Readiness thru Health

BEST AVAILABLE COPY

Table of Contents

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.

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.

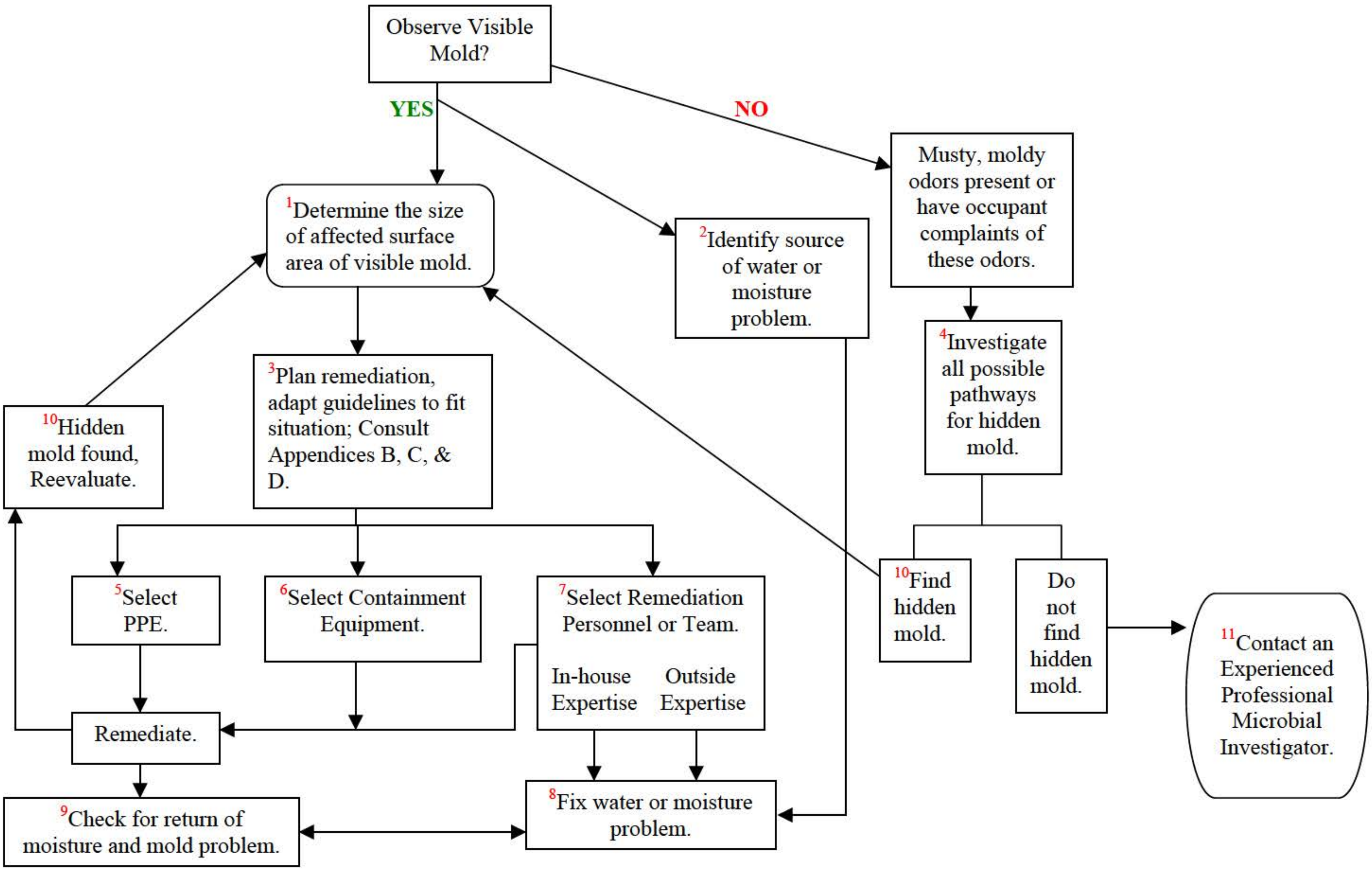
7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

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.

USACHPPM
Readiness thru Health

Industrial Hygiene Study

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

Prepared for:

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

Prepared by:

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

Report Date: December 30, 2008

Project ID: IHMO080101.03

Non-Responsive [redacted]

Manager, Charlotte Operations

Non-Responsive [redacted]

Senior Industrial Hygienist

TABLE OF CONTENTS

List of Appendices

EXECUTIVE SUMMARY

An industrial hygiene survey was conducted August 6, 2008 at the Armory located in Westminster, Maryland. The study was performed by Mr. Non-Responsive, CIH.

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

Lighting within the facility was also evaluated. Lighting was found to be within applicable recommended levels.

Various surfaces within the HVAC system and throughout the facility were screened for lead. The screening was completed using surface/wipe and air samples. None of the air samples collected were found to have detectable levels of the respective lead contaminant. Lead contamination was identified in the old firing range HVAC system, floor as well as the inside cover of the fan coil unit located in Office 5.

Indoor air quality parameters were also evaluated during the assessment. Indoor air quality was found to be within those parameters established by the Environmental Protection Agency (EPA) and American Society of Heating, Refrigerating, and Air-conditioning Engineers, Inc. (ASHRAE).

During the assessment, written programs for Health and Safety, NESHAP Operations and Maintenance Asbestos Survey, and the Hazard Communication Program were requested for review, however, the onsite personnel was not able to locate the documents.

Operation Description

The Westminster Armory primarily serves as an office setting and equipment storage facility. The facility consists of a single story plus basement response center that contains office spaces, decommissioned gun range, and storage areas.

The exterior walls of the building were constructed of a concrete block system (CBS) finished with red brick. The interior walls were composed of concrete block and in some areas were finished with drywall. The roof of the facility consisted of a pitched metal shingle. The heating, ventilating, and air conditioning system (HVAC) consisted of individual fan coil units in offices as well as a split direct-expansion (DX) system on the drill floor. The floors were composed of a poured concrete slab and in some areas were finished with 12”x12” vinyl floor tiles. The ceilings were generally composed of metal corrugated roof deck and in some areas were finished with a suspended drop ceiling system.

Site personnel at the time of the site assessment consisted of 5 administrative personnel. The employees on site were conducting general administrative work.

Noise Survey

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

Lead Testing

At the time of the assessment, no activities were observed which may lead to lead exposure other than ammunition handling. The facility contains a converted garage which was once an indoor firing range.

Various surfaces within the facility were screened for lead using surface/wipe samples and the collection of air samples. Surface/wipe samples were collected using Ghost Wipe^{TM} 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.

BEST AVAILABLE COPY

Lead Testing Results Summary

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

Key: ND – None Detected
PB – Lead

No deteriorated paint was observed in the facility. Surface lead was detected in the supply duct of the garage/firing range, garage floor, and stairwell to garage and inside cover of the fan coil unit located in office 5 (Supply side of unit ventilator). The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying contaminated surfaces. In the" Derivation of Wipe Surface Screening Levels for Environmental Chemicals", the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, HUD levels of 40 $\mu g/ft^2$ on floors and 250 $\mu g/ft^2$ on windowsills should be observed.

No detectable levels of lead were identified in those air samples collected. Currently, OSHA observed an 8-hour time weighted average of 50 ug/m^3.

Lighting

A lighting assessment was conducted throughout the facility. The survey was conducted with large bay doors closed. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. 98047EL). The light meter was last calibrated on February 22, 2008. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

BEST AVAILABLE COPY

Light Survey Assessment Summary

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

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

Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a Fluke IAQ Meter, Model 975. The IAQ Meter was last calibrated in April 2008.

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

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population.

The temperature readings from the interior of the structure ranged from 68.9 to 79.7 $^{\circ}$F with relative humidity readings ranging from 49.7 to 56.9%. During the survey, CO_2 levels ranged from 503ppm to 582ppm.

Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,091 ppm (391 ppm + 700 ppm). The results of the testing met the ASHRAE guidelines.

BEST AVAILABLE COPY

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Classroom 7/8	68.9	56.9	507	0
Front Foyer	72.5	56.2	512	0
Room 5 Recruiting	74.3	54.7	578	0
Room 4 RNCO	74.2	54.4	582	0
Room 3 Orderly	76.1	54.8	555	0
Kitchen	76.1	51.2	503	0
Supply Room	77.9	52.2	567	0
Drill Floor	78.1	50.3	545	0
Women's Latrine	77.9	49.7	542	0
Men's Latrine	77.7	51.1	531	0
Bunk Room	78.8	48.7	557	0
Rear Hallway	78.8	49.2	509	0
Locker Room/Gym	78.6	48.6	551	0
Garage/IFR	79.7	51.3	508	0
Outdoors	81.3	58.2	391	0
Criteria	**73.0-79.0**	**30-50**	**<1,091**	**<9.0**

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

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

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

Suspect Asbestos Containing Building Materials

Suspect asbestos containing materials include sheetrock/joint compound, plaster wall and ceiling systems, floor tiles and associated mastic, and vinyl covebase. Thermal system insulation was found to be a combination of paper wrapped fiberglass with PVC elbows as well as some canvas wrapped fiberglass TSI in the mechanical room.

Maintenance Bay

The maintenance bay/garage was not found to contain a local exhaust ventilation system. The Maintenance Bay is used for vehicle storage and facility storage.

The maintenance bay was found to contain custodial items, tools, waste motor oil, ladders and flammable storage cabinet. The flammable storage cabinet contained various paints and cleaning solvents.

BEST AVAILABLE COPY

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

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

Ventilation System Assessment

The facility was found to contain a direct expansion package servicing the drill floor. Filters, supply side and interior components were found to contain dust loading.

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

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

Limitations

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

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

References

Title 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration.

Lead - (29 CFR 1910.1025(h))

American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2008 Edition

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

Georgia Army National Guard: Standard Army Safety and Occupational Health Inspection Checklist; 1 October 1999 Edition

ANSI Z358.1 – 2004, Emergency Eye Wash and Shower Equipment

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

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

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

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

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

BEST AVAILABLE COPY

Appendix A

Photographs

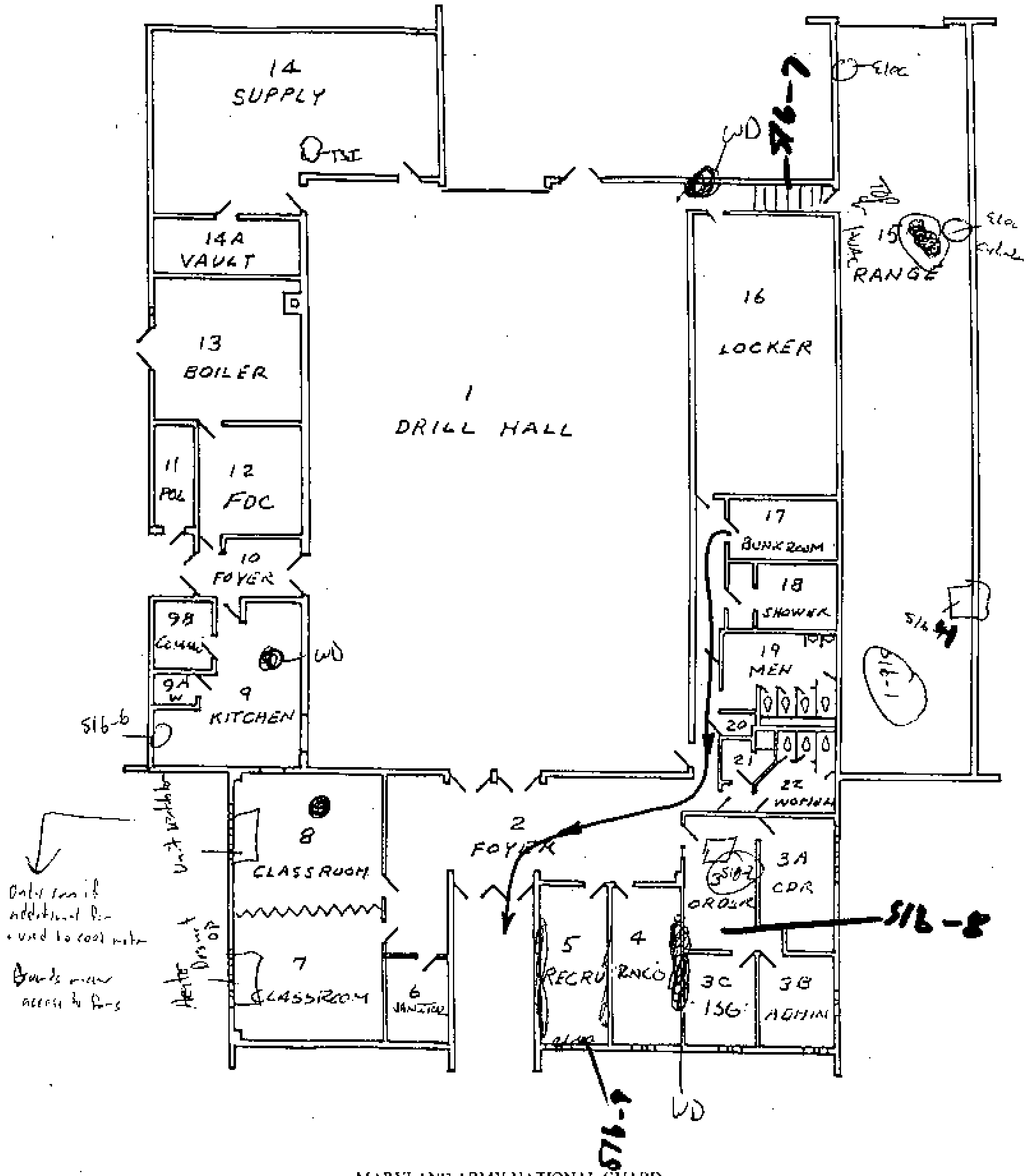
BEST AVAILABLE COPY

Exterior view of facility

Water damaged ceiling panel in Office 5

Mechanical system in Garage

Fan coil unit located in Class 8.



MARYLAND ARMY NATIONAL GUARD
General Henry C. Evans Armory
EVACUATION PLAN

BEST AVAILABLE COPY

Appendix B

Laboratory Analysis Report

AMA Analytical Services, Inc.

Invoice: 95255

Client: National Guard Bureau

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

Job Name: RC 516 Westminster, MD
Job Location: Not Provided
Job Number: Not Provided
P.O. Number: Not Provided

Chain Of Custody: 181398
Date Submitted: 9/4/2008
Date Analyzed: 9/9/2008
Date Invoiced: 9/9/2008
Person Submitting: [redacted]

Attention: [redacted]

Page 1 of 1

AMA Sample #	Client Sample #	Analysis and Sample Type	Turn Around	Cost	Additional Analysis and Sample Type *	Turn Around *	Additional Cost *	Total Cost
0881913	516-1	AA Lead Air	5 Day +	$8.00				$8.00
0881914	516-2	AA Lead Air	5 Day +	$8.00				$8.00
0881915	516-3	AA Lead Air	5 Day +	$8.00				$8.00
0881916	516-4	AA Lead Wipe	5 Day +	$8.00				$8.00
0881917	516-5	AA Lead Wipe	5 Day +	$8.00				$8.00
0881918	516-6	AA Lead Wipe	5 Day +	$8.00				$8.00
0881919	516-7	AA Lead Wipe	5 Day +	$8.00				$8.00
0881920	516-8	AA Lead Wipe	5 Day +	$8.00				$8.00
0881921	516-9	AA Lead Wipe	5 Day +	$8.00				$8.00
0881922	516-10	AA Lead Wipe	5 Day +	$8.00				$8.00

Sub-Total:	$80.00
Additional Charge:	$0.00
Total:	$80.00

Note: Payment Due Upon Receipt.
Note: All Accounts over 30 days are subject to a 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 516 Westminster, MD	**Chain Of Custody:**	181398		
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	Not Provided	**Date Analyzed:**	9/9/2008	**Report Date:**	9/9/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0881913	516-1	Flame	Air	1056	N/A	2.84	ug/m³	<	2.8	ug/m³	
0881914	516-2	Flame	Air	968	N/A	3.10	ug/m³	<	3.1	ug/m³	
0881915	516-3	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	
0881916	516-4	Flame	Wipe	****	0.108	111.52	ug/ft²		400	ug/ft²	
0881917	516-5	Flame	Wipe	****	0.108	111.52	ug/ft²		1600	ug/ft²	
0881918	516-6	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0881919	516-7	Flame	Wipe	****	0.108	111.52	ug/ft²		290	ug/ft²	
0881920	516-8	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0881921	516-9	Flame	Wipe	****	0.108	111.52	ug/ft²		230	ug/ft²	
0881922	516-10	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	

BEST AVAILABLE COPY

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

100470
NY ELAP
10920

Client:	National Guard Bureau	**Job Name:**	RC 516 Westminster, MD	**Chain Of Custody:**	181398
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	9/9/2008
				Report Date:	9/9/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (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 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: [redacted]

Technical Manager: [redacted]

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

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	JTN-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.

QC Summary

Sample Delivery Group: 16549

Analysis Type:	Flame
Sample Type.	Wipe
Analysis Date:	9/9/2008

		Result		Percent Recovery	RPD	Comment
Preparation Blank		-0.052	ppm			Acceptable
Report Limit Verification Sample		0.2705	ppm	81.2%		Acceptable
Expected Spike Level (ppm)	0.3333					
Duplicate Sample 1		#Num!	mg/Kg			
Duplicate Sample 2		#Num!	mg/Kg		#Error	#Error
Matrix Spike Analysis						
Spiked Sample				95.13%		Acceptable
Spike Duplicate						Acceptable
Laboratory Control Sample 1		315.233	µg	102.83%		Acceptable
Laboratory Control Sample 2		304.974	µg	102.95%	0.11%	Acceptable

Calibration Information

Correlation of Calibration Curve 0.999908

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181397	81902	486-4
181397	81903	486-5

SDG Number: 16549

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181397	81904	486-6
181397	81905	486-7
181397	81906	486-8
181397	81907	486-9
181397	81908	486-10
181398	81916	516-4
181398	81917	516-5
181398	81918	516-6
181398	81919	516-7
181398	81920	516-8
181398	81921	516-9
181398	81922	516-10

EI

SAMPLE CHAIN OF CUSTODY

DATE SHIPPED	# OF SAMPLES	SAMPLE MEDIA TYPE	PROJECT NAME
	10		#516 / 181398

CONTACT	TELEPHONE NUMBER

SAMPLE # OR AREA	SAMPLE DATE	SAMPLE VOLUME	ANALYSIS REQUESTED
516-1	8/6/08	1056.02	Lead Air
516-2	↓	967.88	↓
516-3		∅	
516-4 (Range Flr)	↓	100cm²	Lead Wipe
516-5 (Range HVAC)		100cm²	↓
516-6 (Ant Fndn)		100cm²	
516-7 (Stair Flr Rm)		100cm²	
516-8 (Rm 3 shelf)		100cm²	
516-9 (Rm 5 AC/HT)		100cm²	
516-10 (Blank)		∅	

Samples Relinquished By:	Non-Responsive [redacted]	8/19/08 Date
Samples Received By:	Signature	/ Date
Samples Analyzed By:	Signature	/ Date

Westminster

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) 181398

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 #: 704 583 1650

Submittal Information:
1. Job Name: KC 516 Westminster, MD
2. Job Location:
3. Job #: [redacted] P.O. #:
4. Contact Person [redacted] @ phone # 336 455 2558
5. Submitted by: [redacted] Signature: [redacted]

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

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ___ ☐ 24 Hours Time Due: ___ Comments: ___	☐ Immediate ☐ 3 Day ☐ Next Day ☒ 5 Day + ☐ 2 Day Date Due: 09/11/08 ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☐ Includ[redacted]ith Report ☒ Email [redacted] ei...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___) 7 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid ___(QTY)
☐ TCLP ___(QTY)
☐ Drinking Water ___(QTY)
☐ Waste Water ___(QTY)
☐ Dust Wipe Furnace (wipe type___) ___(QTY)

Mold - Direct Microscopic Analysis
☐ Collection Apparatus for Spore Traps: ___
☐ Spore Trap ___(QTY) ☐ Bulk ___(QTY)
☐ Surface Swab ___(QTY) ☐ Surface Vacuum Dust ___(QTY)
☐ Surface Tape ___(QTY) ☐ Other (Specify___) ___(QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX / CLIENT CONTACT

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)
	See Attached																Date/Time: Contact: By:
																	Date/Time: Contact: By:
																	Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 9/4/08 @800 Via: UPS By (Print): M. Sampson Sign: [signature]
2. Date/Time Analyzed: ___/___/___ @___ By (Print): ___ Sign: ___
3. Results Reported To: ___ Via: ___ Date: ___/___/___ Time: ___ Initials: ___
4. Comments: ___

National Guard Region North

National Guard Readiness Center
Industrial Hygiene Evaluation
Westminster Army National Guard Armory
Westminster, MD 21157-4699

Prepared for:

National Guard Region North
Industrial Hygiene Office
301 Old Bay Lane
Havre De Grace, MD 21078

Attn: [redacted]

Prepared by:

Bonus Environmental, LLC
P.O. Box 121
Mt. Pleasant, Michigan 48804

Project No. 1061-03
August 21, 2010

Bonus Environmental, LLC

TABLE OF CONTENTS

APPENDICES

Appendix A *Shop Diagram*

Appendix B *Lead Sample Results*

Appendix C *Photographs*

Appendix D *References*

August 21, 2010
Project No. 1061-03

National Guard Region North
Industrial Hygiene Office
301 Old Bay Lane
Havre De Grace, MD 21078-4003

Attn: [redacted]

Project: Army National Guard Readiness Center, Industrial Hygiene Evaluation
Westminster Army National Guard Armory

1.0 - EXECUTIVE SUMMARY

Bonus Environmental, LLC was contracted by the National Guard Bureau Region North to identify and measure the existence and extent of potentially hazardous operations or conditions at the Westminster Army National Guard Readiness Center located at 350 Hahn Road in Westminster, Maryland. The purpose of this evaluation was to generate or to update a previous baseline evaluation so that employee exposure history can be provided to each civilian and military employee. The following industrial hygiene and safety programs were evaluated during this industrial hygiene evaluation performed by Bonus Environmental, LLC representative [redacted] on May 21, 2010:

- Indoor Air Quality
- Use of items on the Hazardous Materials List
- Vehicle maintenance activities
- Lead Wipe & Air Sampling
- Illumination
- Ergonomics
- Evaluation of the physical condition of the facility in regards to peeling paint, asbestos containing materials, water damage or mold problems, and housekeeping practices.

The Westminster Readiness Center is an Army National Guard armory comprised of offices, a drill hall, a kitchen, a fitness room, a boiler room, and a former indoor firing range. There is no current point of contact for this facility, as it is currently used by only two (2) recruiters and a caretaker. Therefore, no full-time administrative or maintenance personnel are employed in the approximately 19,530 ft² facility. A shop diagram depicting the locations of the operations identified during this industrial hygiene evaluation is attached to this report as Appendix A.

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

2.0 – LEAD SAMPLING

2.1 – Lead Wipe Sampling

Lead wipe sampling was performed according to the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame). Sixteen (16) wipe samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. The following table outlines the locations and analytical results for the lead wipe samples collected during this project

Army National Guard – Westminster Readiness Center Lead Wipe Sample Results				
Sample #	***Sample Date***	***Sample Location***	***Sample Area (ft^2)***	***Sample Result ($\mu g/ft^2$)***
W-W-1	5-21-10	Field Blank	---	< 12
W-W-2	5-21-10	Drill hall, SW corner, top of Master Control Panel box	0.111	220
W-W-3	5-21-10	Drill hall, NE corner, top of fire extinguisher housing	0.111	< 110
W-W-4	5-21-10	Drill hall, north wall, top ledge of chalkboard	0.111	230
W-W-5	5-21-10	Drill hall, floor, east end “free throw” line	0.111	< 110
W-W-6	5-21-10	Drill hall, floor, west end “free throw” line	0.111	< 110
W-W-7	5-21-10	Kitchen, top of stove hood	0.111	< 110
W-W-8	5-21-10	Room 15, former indoor firing range, exhaust ventilation duct	0.111	1300
W-W-9	5-21-10	Room 15, former indoor firing range, center of room, light fixture	0.111	840
W-W-10	5-21-10	Room 15, former indoor firing range, floor, center of room	0.111	< 110
W-W-11	5-21-10	Room 15, former indoor firing range, south side of room, top of locker	0.111	< 110
W-W-12	5-21-10	Stairway handrail, north of room 15	0.111	< 110
W-W-13	5-21-10	Room 7/8, west side, Internet Access Point keyboard	0.111	< 110
W-W-14	5-21-10	Room #2, foyer, east wall, top of drinking fountain	0.111	< 110
W-W-15	5-21-10	Room 3B, surface of office desk	0.111	< 110
W-W-16	5-21-10	Room #16, top of exercise machine	0.111	< 110
W-W-17	5-21-10	Room #13, boiler room, top of water heater	0.111	760

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

2.2 – Lead Air Sampling

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

Representative fixed area sampling was conducted for potential airborne concentrations of lead in accordance with accepted Industrial Hygiene methods recognized by the National Institute for Occupational Safety and Health (NIOSH) and OSHA. Representative breathing zone samples were not collected from an employee performing administrative tasks.

Lead exposure monitoring was performed in accordance with the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame) with SKC personal air sampling pumps calibrated to 2.0 liters per minute. All samples were collected on 37 mm diameter cassettes with mixed-cellulose ester filters. All sampling pumps were calibrated before and after each use to ensure volume accuracy. Two (2) samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. Analytical results of the lead wipe and air samples are attached to this report as Appendix B.

Army National Guard – Westminster Readiness Center
Lead Air Sample Results

Sample #	Sample Type	Sample Location	Flow Rate	Start	Stop	Vol.	Rpt. Limit (µg/m³)	Results (µg/m³)	8 hr TWA (µg/m³)
May 21, 2010									
W-A-1	FB	Field Blank	---	---	---	0	3	< 3	N/A
W-A-2	IWA	Room 3, during daily activities	2.0	0915	1513	716	4.2	< 4.2	N/A
W-A-3	IWA	Room 15, former indoor firing range	2.0	0916	1514	716	4.2	< 4.2	N/A

PS = Personal sample, **IWA** = Inside work area, **N/A** = Not Applicable
Note: The OSHA PEL of 50 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 Westminster Readiness Center, Bonus Environmental, LLC performed a visual inspection of the facility in regards to lead-based paint. Bonus Environmental, LLC identified one area of peeling paint which could potentially pose a lead exposure hazard. This area was the north wall of room 9 (Kitchen). One (1) bulk sample paint chip was collected from the north wall of room 9 (Kitchen). The paint chip sample was sent under chain-of-custody procedures to AMA Analytical Services, Inc. located in Lanham, Maryland for analysis. Sample analysis has indicated that the paint chip sample did not contain detectable levels of lead. The paint is therefore not considered to be lead-based paint. Analytical results are attached to this report as Appendix B.

3.2 – Presumed Asbestos Containing Materials

During the industrial hygiene evaluation of the Army National Guard Westminster Readiness Center, Bonus Environmental, LLC performed a visual inspection to identify presumed asbestos containing materials (PACM) and, if found, to note their condition. Bonus Environmental, LLC did not identify any PACM that was considered to be in poor or damaged condition, with the exception of minor localized damage to presumed asbestos containing 12” x 12” floor tile located in room 15.

3.3 - Water Damage/Mold Growth

During the industrial hygiene evaluation of the Army National Guard Westminster Readiness Center, Bonus Environmental, LLC performed a visual inspection to report the location and perform an evaluation of any water damaged or visible mold problems. Water-stained ceiling materials were noted in room 7/8, room 9 (kitchen), room 13 (boiler room), and at the top of the stairway leading down to room 15. No active fungal growth was seen.

3.4 - Housekeeping

During the industrial hygiene evaluation of the Army National Guard Westminster Readiness Center, Bonus Environmental, LLC performed an evaluation of the housekeeping practices. Bonus Environmental, LLC found the housekeeping to be in good order.

3.5 – Employee Interviews

During the industrial hygiene evaluation of the Army National Guard Westminster Readiness Center, Bonus Environmental, LLC performed interviews and made observations to determine if the work activities being performed possessed any concerns. Following the interviews and observations, no ergonomic and or indoor air quality concerns were identified.

3.6 – Indoor Air Quality

During the industrial hygiene evaluation of the Army National Guard Westminster Readiness Center, Bonus Environmental, LLC measured temperature, relative humidity, carbon monoxide (CO), and carbon dioxide (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 416 ppm to 558 ppm and indicate adequate ventilation within the facility.

Carbon monoxide, also known as the "silent killer," is a colorless, odorless, poisonous gas that results from the incomplete burning of common fuels such as natural or liquefied petroleum gas, oil, wood or coal. When carbon monoxide is inhaled, it enters the blood stream and reduces the ability of the blood to carry oxygen to vital organs, such as the heart and brain. Because it is impossible to see, taste or smell the toxic fumes, CO can harm you before you are aware it is in your work area. At lower levels of exposure, CO causes mild effects that are often mistaken for the flu. These symptoms include headaches, dizziness, disorientation, nausea and fatigue. The effects of CO exposure can vary greatly from person to person depending on age, overall health and the concentration and length of exposure. The OSHA has established a PEL of 50 ppm. OSHA standards prohibit worker exposure to more than 50 parts of the gas per million parts of air averaged during an 8-hour time period. The peak CO level for employees is 200 ppm. The CO measurements collected during this industrial hygiene evaluation ranged from 0.6 ppm to 2.1 ppm. CO levels were well below the OSHA PEL during this industrial hygiene evaluation.

During the industrial hygiene evaluation of the Army National Guard Westminster Readiness Center, Bonus Environmental, LLC collected temperature measurements. Temperature measurements throughout the facility ranged from 70.8ºF to 76.4ºF and are considered to be within an acceptable range.

During the industrial hygiene evaluation of the Army National Guard Westminster Readiness Center, Bonus Environmental, LLC collected relative humidity measurements. Relative humidity measurements throughout the facility ranged from 46.1% to 58.5% and are considered to be within an acceptable range. Indoor air quality measurements recorded during this industrial hygiene evaluation are summarized in the table below.

Army National Guard – Westminster Readiness Center Indoor Air Quality Measurements				
Location	*CO_2 (ppm)*	*CO (ppm)*	*Relative Humidity (%)*	*Temperature (ºF)*
Outdoors, north side of building	391	2.1	46.9	75.5
Room 9 (Kitchen)	516	2.1	46.1	76.4
Room 7/8	533	1.9	47.0	75.1
Room 3	521	1.5	47.3	74.2
Room 19	509	1.5	49.4	73.2
Room 16	482	1.5	50.2	72.6
Room 15, west end	416	1.6	58.5	70.8
Room 1 (Drill hall), center of room	506	1.4	54.1	71.0
Room 13 (Boiler room)	558	0.6	50.8	77.4

Required/Recommended Values
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 – Westminster Readiness Center Lighting Survey			
Location	*Measurement in Foot Candles*	*Requirement in Foot Candles*	*Requirement Met?*
Room 7/8 – Classroom	81.7	30	YES
Room 6 – Caretaker's storage	74.2	30	YES
Room 2 – Foyer	50.2	5	YES
Room 5 – Office	65.9	50	YES
Room 4 – Office	51.8	50	YES
Room 3 – Office	71.7	50	YES
Room 3A – Office	67.4	50	YES
Room 3B – Office	96.9	50	YES
Room 3C – Office	88.4	50	YES
Room 22 – Women's restroom	52.6	5	YES
Room 21 – Women's showers	67.2	5	YES
Room 19 – Men's restroom	51.5	5	YES
Room 18 – Men's showers	71.9	5	YES
Restrooms hallway	83.1	5	YES
Room 17 – Storage	31.0	30	YES
Room 16 – Fitness room	17.2	30	NO
Room 15 – Former indoor firing range	25.7	30	NO
Room 1 – Drill hall	51.4	30	YES
Room 10 – Foyer	44.2	5	YES
Room 12 – Storage	35.3	30	YES

Army National Guard – Westminster Readiness Center ***Lighting Survey***			
Location	*Measurement in Foot Candles*	*Requirement in Foot Candles*	*Requirement Met?*
Room 13 – Boiler room	22.3	30	NO
Room 9 – Kitchen	77.8	10	YES
Room 9B – Kitchen storage	70.3	30	YES
Room 9A – Kitchen pantry	58.8	30	YES
Room 11 – POL room	Lights inoperable		
Room 14 – Supply	Inaccessible		
Room 14A – Vault	Inaccessible		

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

5.0 - CONCLUSION

Bonus Environmental, LLC was contracted by the National Guard Bureau Region North to identify and measure the existence and extent of potentially hazardous operations or conditions at the Westminster Army National Guard Readiness Center located at 350 Hahn Road in Westminster, Maryland. The purpose of this evaluation was to generate or to update a previous baseline evaluation so that employee exposure history can be provided to each civilian and military employee. An industrial hygiene evaluation of the facility was performed by Bonus Environmental, LLC representative [redacted] on May 21, 2010:

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

- Carbon Dioxide
- Carbon Monoxide
- Lead-Based Paint
- Lead Air Samples
- Ergonomics
- Temperature
- Relative Humidity
- Housekeeping

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

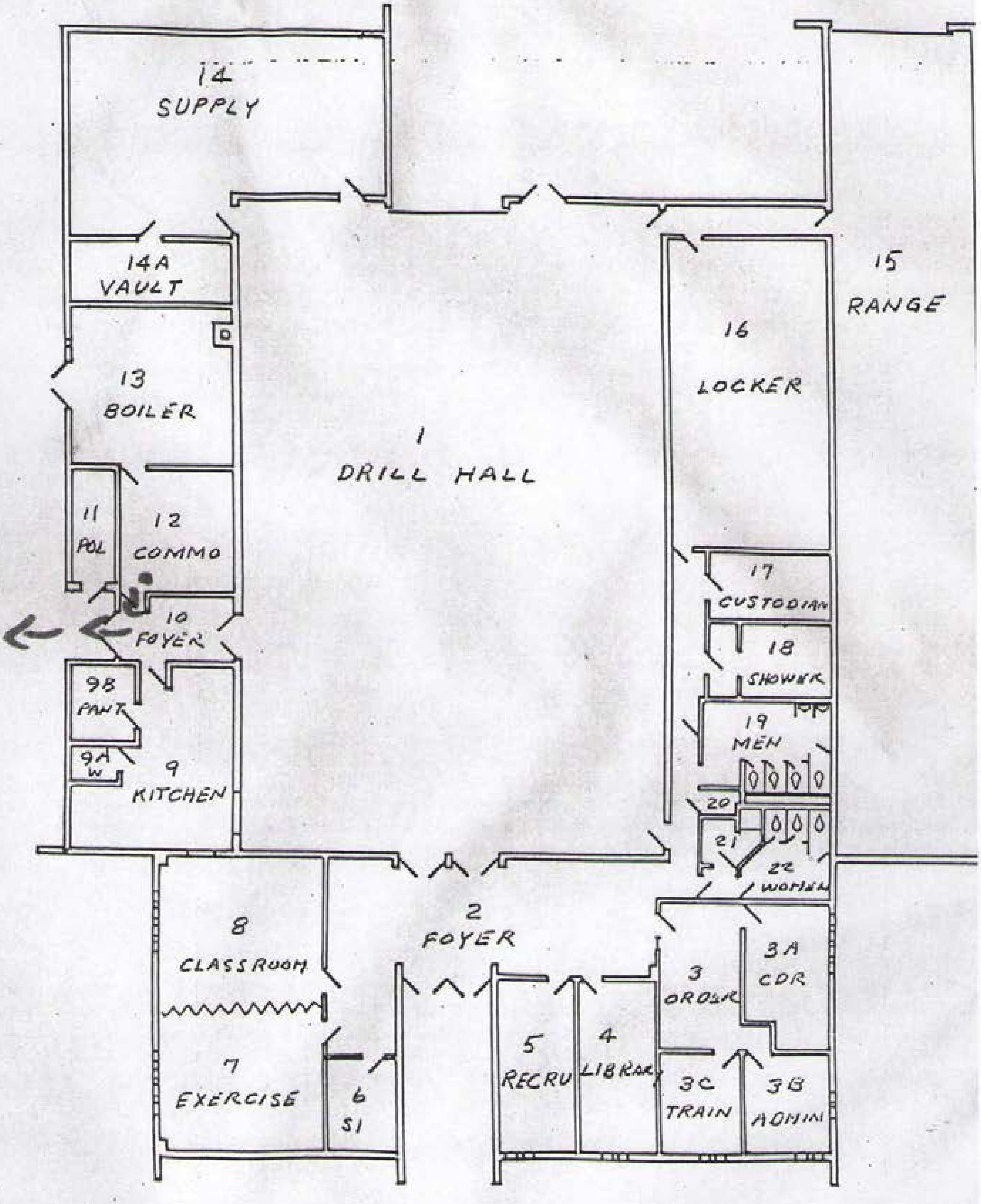
Bonus Environmental, LLC ***P.O. Box 121*** ***Mt. Pleasant, MI 48804***
Work 989-779-7686 ***Fax 989-779-7689*** ***www.bonusenvironmental.com***

BEST AVAILABLE COPY

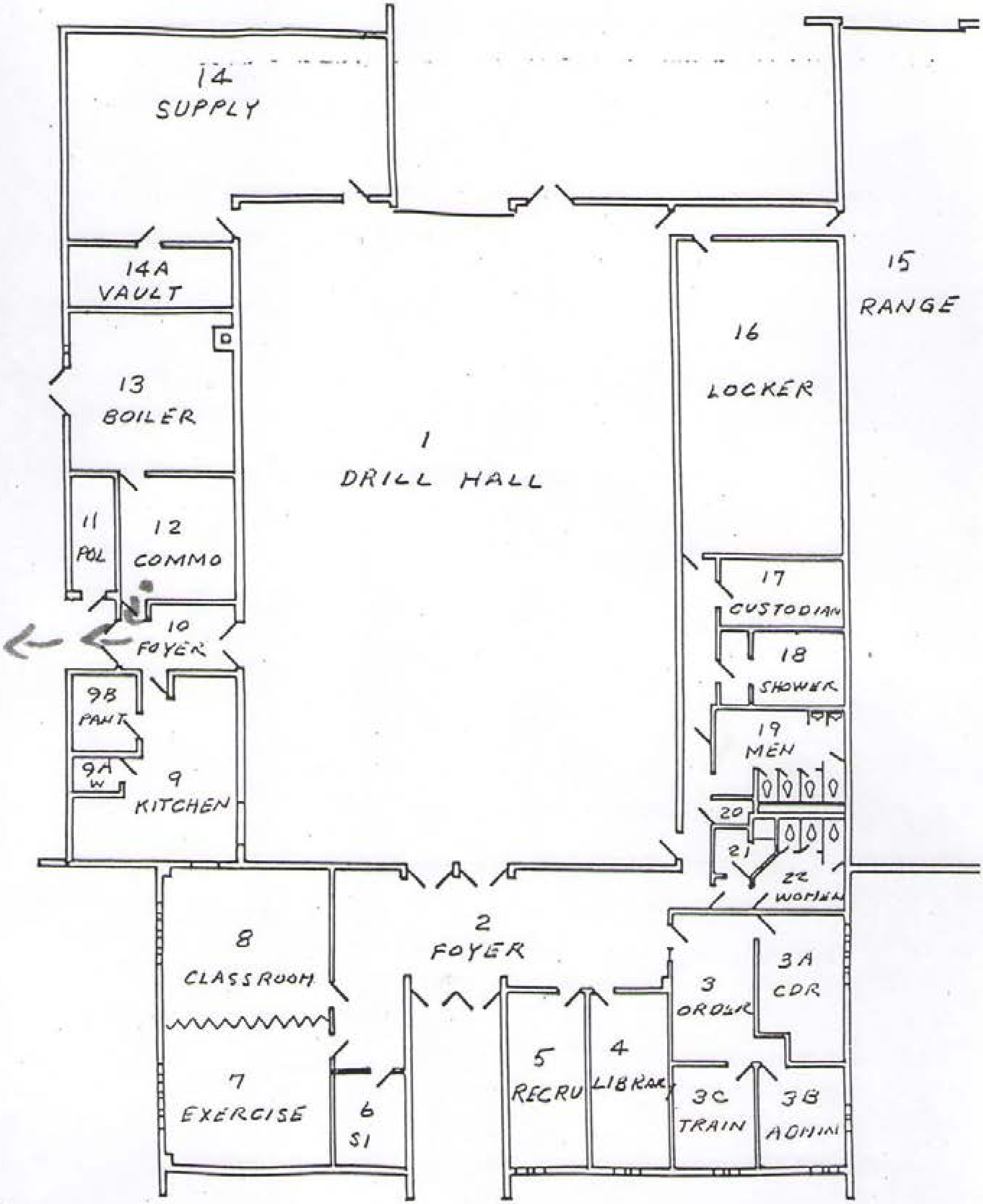
Appendix A

Shop Diagram

BEST AVAILABLE COPY



BEST AVAILABLE COPY
WESTMINSTER ARMORY



WESTMINSTER ARMORY

BEST AVAILABLE COPY

Appendix B

Lead Sample Results

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

RECEIVED JUN 14 2010

ACCREDITED LABORATORY AIHA Environmental Lead See aihaiqap.org for details 100470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Westminster Armory	**Chain Of Custody:**	507201
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Westminster, MD	**Date Submitted:**	5/24/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Westminster Armory	**Person Submitting:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	W912K6-09-A-0003	**Date Analyzed:**	6/1/2010
				Report Date:	6/1/2010

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
1048096	W-PC-1	Flame	Paint Chip	****	N/A	0.0085	%Pb		<0.0085	%Pb	
1048097	W-A-1	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1048098	W-A-2	Flame	Air	716	N/A	4.2	ug/m³				
1048099	W-A-3	Flame	Air	716	N/A	4.2	ug/m³	<3	<4.2	ug/m³	
1048100	W-W-1	Flame	Wipe Blank	****	N/A	12	ug	<3	<4.2	ug/m³	
1048101	W-W-2	Flame	Wipe	****	0.111	110	ug/ft²		<12	ug	
1048102	W-W-3	Flame	Wipe	****	0.111	110	ug/ft²	24	220	ug/ft²	
1048103	W-W-4	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1048104	W-W-5	Flame	Wipe	****	0.111	110	ug/ft²	26	230	ug/ft²	
1048105	W-W-6	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1048106	W-W-7	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1048107	W-W-8	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1048108	W-W-9	Flame	Wipe	****	0.111	110	ug/ft²	140	1300	ug/ft²	
1048109	W-W-10	Flame	Wipe	****	0.111	110	ug/ft²	93	840	ug/ft²	
1048110	W-W-11	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1048111	W-W-12	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1048112	W-W-13	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1048113	W-W-14	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1048114	W-W-15	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 aihaloap.org for details

100470

NY ELAP

10920

Client:	National Guard Bureau	**Job Name:**	Westminster Armory	**Chain Of Custody:**	507201
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation Havre de Grace, Maryland 21078	**Job Location:**	Westminster, MD	**Date Submitted:**	5/24/2010
		Job Number:	Westminster Armory	**Person Submitting:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	W912K6-09-A-0003	**Date Analyzed:**	6/1/2010
				Report Date:	6/1/2010

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
1048115	W-W-16	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1048116	W-W-17	Flame	Wipe	****	0.111	110	ug/ft²	84	760	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: [redacted] Non-Responsive

Technical Manager: [redacted] Non-Responsive

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 19413

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	6/1/2010

	Result		Percent Recovery	RPD	Comment
Preparation Blank	0.025	ppm			Acceptable
Report Limit Verification Sample	0.3251	ppm	97.5%		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	307.002	µg	101.92%		Acceptable
Laboratory Control Sample 2	316.585	µg	100.88%	1.03%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999624

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507201	48100	W-W-1
507201	48101	W-W-2

SDG Number: 19413

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507201	48102	W-W-3
507201	48103	W-W-4
507201	48104	W-W-5
507201	48105	W-W-6
507201	48106	W-W-7
507201	48107	W-W-8
507201	48108	W-W-9
507201	48109	W-W-10
507201	48110	W-W-11
507201	48111	W-W-12
507201	48112	W-W-13
507201	48113	W-W-14
507201	48114	W-W-15
507201	48115	W-W-16
507201	48116	W-W-17

SDG Number: 19413

AMA Analytical Services, Inc.

Focused on Results!!

NVLAP 101143-0
NY ELAP 10920
AIHA Accredited Laboratory – Environmental Lead & Industrial Hygiene
AIHA Accredited Laboratory – Environmental Microbiology
100470

Submitting Samples for National Guard Jobs

1) All samples shall be submitted to AMA Analytical Services, Attn: Sample Receiving, utilizing the enclosed Chain-of-Custody Form. The highlighted areas must be completed by the Subcontractor, however, the Sample Information/Analysis/Matrix section will not need to be completed if field date sheets are submitted with the samples. Please be sure to include a contact phone number for the person submitting the samples.
2) Results shall be reported via email to [redacted]ns:
   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

4475 Forbes Blvd. · Lanham, MD 20706 · (301) 459-2640 · Fax (301) 459-2643 · www.amalab.com

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

OWI (410) 247-2024

159202

507201

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: Westminster Armory
2. Job Location: Westminster, MD
3. Job #: Westminster Armory PO #: W912K6-09-A-0003
4. Contact Pers[redacted]
5. Submitted b[redacted] @ phone # (410) 942-0273 Signature: [redacted]

AFTER HOURS (must be pre-scheduled)

❑ Immediate Date Due: ______
❑ 24 Hours Time Due: ______
Comments: ______

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

NORMAL BUSINESS HOURS

❑ Immediate ❑ 3 Day
❑ Next Day ☒ 5 Day +
❑ 2 Day Date Due: 6/1/10

❑ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

☒ Include [redacted]
☒ [redacted]
❑ Fax: [redacted]
❑ Verb[redacted]

REPORT TO: with Report
@bowlesenvironmental.com
@us.army.mil
@us.army.mil

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
❑ NIOSH 7400 ______(QTY)
❑ Fiberglass ______(QTY)

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

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

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

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

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

TEM Water
❑ Qual. (pres/abs) ______(QTY)
❑ ELAP 198.2/EPA 100.2 ______(QTY)
❑ EPA 100.1 ______(QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples ______°C)

Metals Analysis

☒ Pb Paint Chip 1 (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 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

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
W-PC-1	Rm 9	5-21	—	—				X			X					
W-A-1	Field Blank		0	—				X		X						
W-A-2	Rm 3		716	—				X		X						
W-A-3	Rm 15		716	—				X		X						
W-W-1	Field Blank		—	—				X				X				
W-W-2	Drill Hall		—	4"x4"				X				X				
W-W-3	Drill Hall		—					X				X				
W-W-4	Drill Hall		—					X				X				
W-W-5	Drill Hall		—					X				X				
W-W-6	Drill Hall		—					X				X				
W-W-7	Kitchen		—					X				X				
W-W-8	Rm 15		—					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: 5/24/10 @ 0945 Via: FedEx By (Print) [redacted] Sig[redacted]
2. Date/Time Analyzed: ___/___/___ @ ______ By (Print): Nida
3. Results Reported To: ______ Sign: ______
4. Comments: ______ Via: Mail Date: 6/1/10 Time: 1905 Initials: NM

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

OWI (410) 247-2024

159202

210 REV. 6.08

~~5070~~ 507201
Sheet 2 of 2

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: Westminster Armory
2. Job Location: Westminster, MD
3. Job #: Westminster Armory P.O. #: W912K6-09-A-0003
4. Contact Person [redacted]
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 ☐ Next Day ☐ 2 Day
☐ 3 Day ☒ 5 Day + Date Due: ____
☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

☒ Incl[redacted]
☒ [redacted]
☐ Fax: [redacted]
☐ Verb[redacted]

REPORT TO:
with Report
@DonUjenvironmental.com
@us.army.mil
@us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area)Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☒ Pb Paint Chip 1 (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 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 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
W-W-9	Rm 15	5-21	—	4"x4"												
W-W-10	Rm 15	↓	—	↓				✓				✓				
W-W-11	Rm 15	↓	—	↓				✓				✓				
W-W-12	Stairwell handrail	↓	—	↓				✓				✓				
W-W-13	Rm 7/8	↓	—	↓				✓				✓				
W-W-14	Rm 2	↓	—	↓				✓				✓				
W-W-15	Rm 3 B	↓	—	↓				✓				✓				
W-W-16	Rm 16	↓	—	↓				✓				✓				
W-W-17	Boiler Rm	↓	—	↓				✓				✓				
								✓				✓				

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 C

Photograph

Building Exterior, west entrance


Boiler Room


Boiler Rm., SE corner, water damage from ceiling down


Drill Hall


Room 15, former indoor firing range


Kitchen, peeling LBP on north wall

Kitchen, water damaged ceiling

Room 15, damaged presumed asbestos containing 12"x12" floor tile

Appendix D

References

BEST AVAILABLE COPY

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

NATIONAL GUARD BUREAU
ARMY NATIONAL GUARD
REGION NORTH INDUSTRIAL HYGIENE OFFICE
ATTN: NGB-ARS-IHNE
301-IH OLD BAY LANE
HAVRE DE GRACE, MD 21078

NGB-ARS-IHNE 10 October 2006

MEMORANDUM FOR Maryland Army National Guard (MDARNG) CFMO, LTC Robert McCabe, 5th Regiment Armory, 29th Division Street, Baltimore, MD 21201

SUBJECT: White Oak Readiness Center Indoor Firing Range

1. An email dated 09 October 2006 from the CFMO stated that the White Oak Readiness Center Indoor Firing Range conversion/construction project has been completed. This was based upon a physical inspection of the facility to ensure that it met requirements of the contract. The NGB Region North Industrial Hygiene Office certifies that the surface lead dust was abated IAW NG Pam 385-16, Converting Indoor Firing Ranges to Other Uses.

2. This project required the removal of the bullet trap, ceiling baffles and acoustical tile. Any items stored in the range were cleaned for surface lead dust prior to their removal. Surface lead dust was removed from all surfaces. Two coatings of lead paint encapsulant were used to cover the walls and ceiling. Vinyl tile was used to cover the floor.

3. This office collected pre and post surface lead wipe samples. The samples were sent to AMA Analytical Services, Inc. for analyses. AMA is an American Industrial Hygiene Association (AIHA) accredited laboratory. Post clearance surface lead wipe samples were below 200 micrograms per square foot as required by NG Pam 385-16.

4. Based on the email stated in paragraph 1 and the lead surface sample results, this area can be reoccupied as soon as possible.

5. Please direct any questions regarding the conversion/construction project to the CFMO at (410) 576-6067 and questions regarding surface lead dust sample results to Ms. [redacted] at (410) 942-0273 x23.

[redacted]
NGB Regional Industrial Hygienist

CF:
[redacted] DDS
[redacted]HM

BEST AVAILABLE COPY

[redacted]

From: [redacted] CIV NGB
Sent: Tuesday, October 10, 2006 10:24 AM
To: [redacted] CIV
Subject: FW: White Oak Readiness Center, 12200 Cherry Hill Road, Silver Spring, MD 20904-1690

[redacted]
NGB Regional Industrial Hygienist
Army National Guard
ATTN: NGB-ARS-IHNE
301-IH Old Bay Lane
Havre de Grace, MD 21078
410-942-0273 Ext 23
Cell 443-807-9605
FAX 410-942-0254

From: [redacted] LTC (RET) MDARNG
Sent: Monday, October 09, 2006 11:19 AM
To [redacted] CIV NGB; [redacted] CIV NGB
Cc [redacted] TC MDAR[redacted] TC (Ret) MDARNG
Subject: White Oak Readiness Center, 12200 Cherry Hill Road, Silver Spring, MD 20904-1690

[redacted]

Pursuant to the project specification, the above referenced project has been completed. The contractor:

Maryland Cleaning and Abatement Services
6811 York Road
Baltimore, MD 21212
410-377-0500
M[redacted]

has completed the project per the specifications and all tests have meet the current standards of under 200 microns. The room has been fully encapsulated to current standards.

V/r
[redacted]

PS: Wasn't sure that I sent this to you

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

NVLAP 101143-0
NY ELAP 10920
AIHA 100470

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
Attention: [redacted]

Job Name: White Oak Armory (Silver Spring)
Job Location: Not Provided
Job Number: Not Provided
P.O. Number: Not Provided

Chain Of Custody: 148414
Date Submitted: 7/6/2006
Person Submitting: [redacted]
Date Analyzed: 7/6/2006
Report Date: 06-Jul-06

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
0663765	WO-21	Flame	Wipe	****	0.111	108.01	ug/ft²		940	ug/ft²	
0663766	WO-22	Flame	Wipe	****	0.111	108.01	ug/ft²		1300	ug/ft²	
0663767	WO-23	Flame	Wipe	****	0.111	108.01	ug/ft²		4900	ug/ft²	
0663768	WO-24	Flame	Wipe	****	0.111	108.01	ug/ft²		420	ug/ft²	
0663769	WO-25	Flame	Wipe	****	0.111	108.01	ug/ft²		850	ug/ft²	
0663770	WO-26	Flame	Wipe	****	0.111	108.01	ug/ft²		4000	ug/ft²	
0663771	WO-27	Flame	Wipe	****	0.111	108.01	ug/ft²		300	ug/ft²	
0663772	WO-28	Flame	Wipe	****	0.111	108.01	ug/ft²		210	ug/ft²	
0663773	WO-29	Flame	Wipe	****	0.111	108.01	ug/ft²		550	ug/ft²	
0663774	WO-30	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0663775	WO-31	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 samples.

Analyst: [redacted] Technical Manager: [redacted]

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 13186

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	7/6/2006

		Result		Percent Recovery	RPD	Comment
Preparation Blank		0.117	ppm			Acceptable
Report Limit Verification Sample		0.6053	ppm	181.6%		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				114.79%		Acceptable
Spike Duplicate						Acceptable
Laboratory Control Sample 1		283.748	µg	94.62%		Acceptable
Laboratory Control Sample 2		292.094	µg	97.91%	3.41%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999338

All calibration verification samples are within acceptance limits.

Notes: Recovery for the Report Limit Verification Sample was 181.6%, above the upper control limit of 120%.

Samples Included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
148414	63765	WO-21
148414	63766	WO-22

SDG Number: 13186

BEST AVAILABLE COPY

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
148414	63767	WO-23
148414	63768	WO-24
148414	63769	WO-25
148414	63770	WO-26
148414	63771	WO-27
148414	63772	WO-28
148414	63773	WO-29
148414	63774	WO-30
148414	63775	WO-31
153885	63776	060705E-01
153885	63777	060705E-02
153885	63778	060705E-03
153885	63779	060705E-04
153885	63780	060705E-05
153885	63781	060705E-06
153885	63782	060705E-07
153885	63783	060705E-08

BEST AVAILABLE COPY

NGB-AVS-SG
SUBJECT: All States (Log Number P01-0075) Army National Guard (ARNG) Safety and Occupational Health Program -- POLICY AND RESPONSIBILITIES FOR INSPECTION, EVALUATION AND OPERATION OF ARMY NATIONAL GUARD INDOOR FIRING RANGES

APPENDIX G
SURFACE WIPE SAMPLING SHEET

Industrial Hygiene Surface Wipe Sample Sheet

Return Address NGB Region North IH 301-IH Old Bay Lane Havre De Grace MD 21078	**Point of Contact (name & phone #)** Non-Responsive 410-942-0273 **Samples Collected By** Non-Responsive

Sampled Facility	**City**	**State**	**Location (bldg/area)**
White Oak	Silver Spring	MD	IFR

Description of Operation	**Date Collected**	**Date Shipped**
Indoor Firing Range	6 July 06	6 July 06

Analysis Desired Lead

Sampling Data

Lab Use Only	Sample #	Results	Remarks
	WO-21		right lane, at bullet trap on floor
	WO-22		mid lane, at bullet trap on floor
	WO-23		left lane, at corner by bullet trap on floor
	WO-24		right side wall, 3ft. up, where green paint begins
	WO-25		center lane, 15ft. from firing line
	WO-26		left lane, 20ft. from firing line
	WO-27		top of stairs, on floor
	WO-28		on floor at door leading to armory
	WO-29		new just inside door of range
	Blank, WO-30		
	Blank, WO-31		

Comments to Lab:
100 cm^2 templet used. Please report in ug/ft^2

AMA Analytical Services, Inc.
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 148414

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-14 Old Bay Lane
3. Address 2: Havre De Grace, MD 21078
4. Address 3:
5. Phone #: 410-942-0273 Fax #: 410-942-0254

Submittal Information:
1. Job Name: White Oak Armory (Silver Spring)
2. Job Location:
3. Job #: [redacted] P.O. #:
4. Contact Per[redacted] @ phone # 410-942-0273
5. Submitted b[redacted] Signatur[redacted]

❏ Please include COC/field data sheets with results **Reporting Information (Results will be provide[redacted]ble):**
Date & Time Results Required: 7 / 7 /06 @ 1020 ❏ Immd. ☒ 24hr ❏ 48hr ❏ 72hr ❏ 5 Day + ❏ Immd. After-Hours* ❏ 24hr After-Hours* ❏ Late-Night* (*must be pre-scheduled)
❏ Verbals: ______ @ cell # ______ ❏ Fax Copy: ______ @ fax # ______ ❏ Email Copy: ______ @ ______

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
❏ NIOSH 7400 ___ (QTY)
❏ Fiberglass ___ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
❏ AHERA ___ (QTY)
❏ NIOSH 7402 ___ (QTY)
❏ Other (specify ___) ___ (QTY)
PLM Bulk
❏ EPA 600 – Visual Estimate ___ (QTY)
❏ EPA Point Count ___ (QTY)
❏ NY State Friable ___ (QTY)
❏ Grav. Reduction ELAP 198.1 ___ (QTY)
❏ Other (specify ___) ___ (QTY)

TEM Bulk
❏ ELAP 198.4/Chatfield ___ (QTY)
❏ NY State PLM/TEM ___ (QTY)
❏ Residual Ash ___ (QTY)
TEM Dust
❏ Qual. (pres/abs) Vacuum/Dust ___ (QTY)
❏ Quan. (s/area) Vacuum D5755-95 ___ (QTY)
❏ Quan. (s/area)Dust D6480-99 ___ (QTY)
TEM Water
❏ Qual. (pres/abs) ___ (QTY)
❏ ELAP 198.2/EPA 100.2 ___ (QTY)
❏ EPA 100.1 ___ (QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples ___ °C)

Lead Analysis
❏ Paint Chip ___ (QTY)
☒ Dust Wipe (wipe type Ghost) 11 (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)

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	CLIENT CONTACT (LABORATORY STAFF ONLY)
WO-21		7/6/06		4"x4"				X				X					Date/Time: Contact: By:
WO-22																	
WO-23																	
WO-24																	
WO-25																	Date/Time: Contact: By:
WO-26																	
WO-27																	
WO-28																	
WO-29																	Date/Time: Contact: By:
WO-30	BLANK																
WO-31	BLANK																

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 7 / 6 /06 @ 1020 Via: Drop off By (Print): Kodian Watson Sign:
2. Date/Time Analyzed: ___ / ___ / ___ @ ___ By (Print): ___ Sign: ___
3. Results Reported To: ___ Via: Email Fax Date: 7 / 6 / 06 Time: ___ Initials: ___
4. Comments: ___

BEST AVAILABLE COPY

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

NVLAP 101143-0
NY ELAP 10920
AIHA 100470

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	White Oak Armory (Silver Spring)	**Chain Of Custody:**	148416
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	7/18/2006
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	7/19/2006
Attention:	[redacted]			**Report Date:**	19-Jul-06

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Final Result	Comments
0667506	WO-32	Flame	Wipe	****	0.111	108.01 ug/ft²	260 ug/ft²	
0667507	WO-33	Flame	Wipe	****	0.111	108.01 ug/ft²	220 ug/ft²	
0667508	WO-34	Flame	Wipe	****	0.111	108.01 ug/ft²	180 ug/ft²	
0667509	WO-35	Flame	Paint Chip	****	N/A	0.01 %Pb	0.026 %Pb	
0667510	WO-36	Flame	Wipe	****	0.111	108.01 ug/ft²	840 ug/ft²	
0667511	WO-37	Flame	Wipe	****	0.111	108.01 ug/ft²	950 ug/ft²	
0667512	WO-38	Flame	Wipe	****	0.111	108.01 ug/ft²	140 ug/ft²	
0667513	WO-39	Flame	Wipe	****	0.111	108.01 ug/ft²	130 ug/ft²	
0667514	WO-40	Flame	Wipe	****	0.111	108.01 ug/ft²	140 ug/ft²	
0667515	WO-41	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0667516	WO-42	Flame	Wipe Blank	****	N/A	12.00 ug	< 12 ug	
0667517	WO-43	Flame	Wipe Blank	****	N/A	12.00 ug	< 12 ug	

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP Accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

BEST AVAILABLE COPY

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

NVLAP 101143-0
NY ELAP 10920
AIHA 100470

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	White Oak Armory (Silver Spring)	**Chain Of Custody:**	148416		
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	7/18/2006		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	Not Provided	**Date Analyzed:**	7/19/2006	**Report Date:**	19-Jul-06
Attention:	[redacted]						

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.
Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: [redacted]

Technical Manager: [redacted]

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 13242

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	7/18/2006

	Result		Percent Recovery	RPD	Comment
Preparation Blank	0.037	ppm			Acceptable
Report Limit Verification Sample	0.4182	ppm	125.5%		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			113.94%		Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample 1	272.217	µg	90.20%		Acceptable
Laboratory Control Sample 2	260.150	µg	93.16%	3.23%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.998282

All calibration verification samples are within acceptance limits.

Notes: Recovery for the Report Limit Verification Sample was 125.5%, above the upper control limit of 120%. A passing Report Limit Verification sample for wipe samples for this analysis date can be found with SDG 13238 (105.4% recovery).

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
148416	67506	WO-32
148416	67507	WO-33

SDG Number: 13242

BEST AVAILABLE COPY

Samples Included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
148416	67508	WO-34
148416	67510	WO-36
148416	67511	WO-37
148416	67512	WO-38
148416	67513	WO-39
148416	67514	WO-40
148416	67515	WO-41
148416	67516	WO-42
148416	67517	WO-43
155393	67535	L-5-DOW
155393	67536	L-6-DOW
155393	67537	L-7-DOW
155393	67538	L-8-DOW
155393	67539	L-9-DOW

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 13243

Analysis Type:	Flame
Sample Type:	Paint Chip
Analysis Date:	7/19/2006

		Result		Percent Recovery	RPD	Comment
Preparation Blank		0.058	ppm			Acceptable
Report Limit Verification Sample		0.3433	ppm	103.0%		Acceptable
Expected Spike Level (ppm)	0.3333					
Duplicate Sample 1		226	mg/Kg			
Duplicate Sample 2		220	mg/Kg		2.59%	Acceptable
Matrix Spike Analysis						
Spiked Sample						Acceptable
Spike Duplicate						Acceptable
Laboratory Control Sample 1		327.326	µg	85.26%		Acceptable
Laboratory Control Sample 2		239.535	µg	85.42%	0.18%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.998729

All calibration verification samples are within acceptance limits.

Notes: Insufficient sample submitted for spike or spike duplicate analysis.

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
148416	67509	WO-35
154843	67618	071706-307 Cotton

SDG Number: 13243

BEST AVAILABLE COPY

APPENDIX G
SURFACE WIPE SAMPLING SHEET

Industrial Hygiene Surface Wipe Sample Sheet

Return Address NGB Region North IH 30L 1H Old Bay Lane Havre De Grace MD 21078	Point of Contact *(name & phone #)* Non-Responsive 410-942-0273 Samples Collected By Non-Responsive

Sampled Facility	City	State	Location *(bldg/area)*
White Oak Silver	Spring	MD	IFR

Description of Operation	Date Collected	Date Shipped
Indoor Firing Range	18 July 2006	18 July 2006

Analysis Desired Lead

Sampling Data

Lab Use Only	Sample #	Results	Remarks
	WO-32		Right lane, at bullet trap on floor
	WO-33		mid lane, at bullet trap on floor
	WO-34		left lane, in corner by bullet trap on floor
	WO-35		right side wall, about 3ft. up. Is sample of the green paint. (Bulk.)
	WO-36		right side wall, 3ft up where green paint begins
	WO-37		center lane, 15ft from firing line
	WO-38		left lane, 20ft from firing line
	WO-39		top of stairs, on floor
	WO-40		on floor at door leading to the armory.
	WO-41		just inside door to range, on floor
	WO-42/blank		blank
	WO-43/blank		blank

Comments to Lab:

100cm² templat used. Please report in µg/ft²

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0 · NY ELAP 10920 · AIHA 100470

Client:	National Guard Bureau	**Job Name:**	Converted IFR	**Chain Of Custody:**	148417
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	White Oak Silver Spring, MD-IFR	**Date Submitted:**	8/2/2006
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	
		P.O. Number:	Not Provided	**Date Analyzed:**	8/2/2006

Report Date: 02-Aug-06

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments
0671715	WO-100	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0671716	WO-101	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0671717	WO-102	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0671718	WO-103	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0671719	WO-104	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0671720	WO-105	Flame	Wipe	****	0.111	108.01 ug/ft²	110 ug/ft²	
0671721	WO-106	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0671722	WO-107	Flame	Wipe	****	0.111	108.01 ug/ft²	120 ug/ft²	
0671723	WO-108	Flame	Wipe	****	0.111	108.01 ug/ft²	< 110 ug/ft²	
0671724	WO-109	Flame	Wipe Blank	****	N/A	12.00 ug	< 12 ug	
0671725	WO-110	Flame	Wipe Blank	****	N/A	12.00 ug	< 12 ug	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B

See QC Summary for analytical results of quality control samples associated with these samples.

N/A = Not Applicable   mg/Kg = parts per million (ppm) by weight   mg/L = parts per million (ppm)

%Pb = percent lead by weight   ug = micrograms   ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Analyst: [redacted]   Technical Manager: [redacted]

BEST AVAILABLE COPY

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 13311

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	8/2/2006

	Result		Percent Recovery	RPD	Comment
Preparation Blank	0.083	ppm			Acceptable
Report Limit Verification Sample	0.4071	ppm	122.1%		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			112.73%		Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample 1	282.893	µg	91.77%		Acceptable
Laboratory Control Sample 2	278.678	µg	91.71%	0.07%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999763

All calibration verification samples are within acceptance limits.

Notes: Recovery for the Report Limit Verification Sample was 122.1% above the upper control limit of 120%. A passing Report Limit Verification sample for wipe samples for this analysis date can be found with SDG 13308 (111.01% recovery).

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
148417	71715	WO-100
148417	71716	WO-101

SDG Number: 13311

BEST AVAILABLE COPY

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
148417	71717	WO-102
148417	71718	WO-103
148417	71719	WO-104
148417	71720	WO-105
148417	71721	WO-106
148417	71722	WO-107
148417	71723	WO-108
148417	71724	WO-109
148417	71725	WO-110

SDG Number: 13311

BEST AVAILABLE COPY

APPENDIX F

SURFACE WIPE SAMPLING SHEET

Industrial Hygiene Surface Wipe Sample Sheet

Return Address Region North IH 301-IH Old Bay Lane Havre De Grace, MD 21078	**Point of Contact** *(name & phone #)* [redacted]10-942-0273 Ext 25
	Samples Co[redacted]

Sampled Facility	**City**	**State**	**Location** *(bldg/area)*
White Oak	Silver Spring	MD	1 FR

Description of Operation	**Date Collected**	**Date Shipped**
Converted IFR	2 Aug 06	2 Aug 06

Analysis Desired
Lead

Sampling Data

Location	Sample #	Results	Remarks
Right Lane (Lane 5) at Bullet trap on Floor	WO-100		
Middle Lane (Lane 3) at Bullet trap on Floor	WO-101		
Left Lane (Lane 1) in corner	WO-102		
Right wall, 3 ft up, where green paint begins	WO-103		
Center Lane (3) 15 ft from Firing Line	WO-104		
Left Lane (1) 20 ft from firing Line	WO-105		
top of stairs, on floor	WO-106		
on floor, just inside outer door to firing range	WO-107		
on floor, just inside range door	WO-108		
BLANK	WO-109		
BLANK	WO-110		
~~BLANK~~ CM	~~WO-111~~ CM		

Comments to Lab:

AMA Analytical Services, Inc.
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 148417

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-1H Old Bay Lane
3. Address 2: Havre De Grace, MD 21078
4. Address 3:
5. Phone #: 410-942-0273 Fax #: 410-942-0254

Submittal Information:
1. Job Name: Converted IFR
2. Job Location: White Oak Silver Spring MD - IFR
3. Job #: P.O. #:
4. Contact Pers[redacted] @ phone #
5. Submitted by: Signature:

☒ Please include COC/field data sheets with results **Reporting Information (Results will be provided as soon as technically feasible):**
Date & Time Results Required: 8 / 3 / 06 @ 1200 ☐ Immd. ☒ 24hr ☐ 48hr ☐ 72hr ☐ 5 Day + ☐ Immd. After-Hours* ☐ 24hr After-Hours* ☐ Late-Night* (*must be pre-scheduled)
☐ Verbals: @ cell # ☐ Fax Copy: @ fax # ☒ Email Copy: @

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ NIOSH 7400____(QTY)
☐ Fiberglass____(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ AHERA____(QTY)
☐ NIOSH 7402____(QTY)
☐ Other (specify____)____(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate____(QTY)
☐ EPA Point Count____(QTY)
☐ NY State Friable____(QTY)
☐ Grav. Reduction ELAP 198.1____(QTY)
☐ Other (specify____)____(QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield____(QTY)
☐ NY State PLM/TEM____(QTY)
☐ Residual Ash____(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust____(QTY)
☐ Quan. (s/area) Vacuum D5755-95____(QTY)
☐ Quan. (s/area)Dust D6480-99____(QTY)
TEM Water
☐ Qual. (pres/abs)____(QTY)
☐ ELAP 198.2/EPA 100.2____(QTY)
☐ EPA 100.1____(QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples ____°C)

Lead Analysis
☐ Paint Chip____(QTY)
☒ Dust Wipe (wipe type Ghost) 11 (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	CLIENT CONTACT (LABORATORY STAFF ONLY)
WO-100		8/2	N/A	4"x4"				X									Date/Time: Contact: By:
WO-101																	
WO-102																	
WO-103																	
WO-104																	Date/Time: Contact: By:
WO-105																	
WO-106																	
WO-107																	
WO-108																	Date/Time: Contact: By:
WO-109																	
WO-110																	

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 8 / 2 / 06 @ 905 Via: Drop off By (Print): Kadian Watson Sign: [illegible]
2. Date/Time Analyzed: / / @ By (Print): Sign:
3. Results Reported To: Via: email Date: 8 / 2 / 6 Time: Initials: [illegible]
4. Comments:

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	White Oak Armory (Silver Spring MD)	**Chain Of Custody:**	150757
Address:	301-IH Old Bay Lane, Attn NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	6/21/2006
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	6/21/2006
				Report Date:	21-Jun-06

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0659363	WO-01	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659364	WO-02	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659365	WO-03	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659366	WO-04	Flame	Wipe	****	0.111	108.01	ug/ft²		3700	ug/ft²	
0659367	WO-05	Flame	Wipe	****	0.111	108.01	ug/ft²		190	ug/ft²	
0659368	WO-06	Flame	Wipe	****	0.111	108.01	ug/ft²		430	ug/ft²	
0659369	WO-07	Flame	Wipe	****	0.111	108.01	ug/ft²		160	ug/ft²	
0659370	WO-08	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659371	WO-09	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659372	WO-10	Flame	Wipe	****	0.111	108.01	ug/ft²		250	ug/ft²	
0659373	WO-11	Flame	Wipe	****	0.111	108.01	ug/ft²		260	ug/ft²	
0659374	WO-12	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659375	WO-13	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659376	WO-14	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659377	WO-15	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659378	WO-16	Flame	Wipe	****	0.111	108.01	ug/ft²		150	ug/ft²	
0659379	WO-17	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659380	WO-18	Flame	Wipe	****	0.111	108.01	ug/ft²		170	ug/ft²	
0659381	WO-19	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0659382	WO-20	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	

NGB-AVS-SG
SUBJECT: All States (Log Number P01-0075) Army National Guard (ARNG) Safety and Occupational Health Program -- POLICY AND RESPONSIBILITIES FOR INSPECTION, EVALUATION AND OPERATION OF ARMY NATIONAL GUARD INDOOR FIRING RANGES

APPENDIX G
SURFACE WIPE SAMPLING SHEET

Industrial Hygiene Surface Wipe Sample Sheet

Return Address ARNG 301-IH Old Bay Lane Havre de Grace, MD 21078	**Point of Contact (name & phone #)** Non-Responsive [redacted] 410-942-0273
	Samples Collected By Non-Responsive [redacted]

Sampled Facility	City	State	Location (bldg/area)
White Oak	Silver Springs	MD	IFR

Description of Operation	Date Collected	Date Shipped
Indoor Firing Range	20 Jun 06	20 Jun 06

Analysis Desired LEAD

Sampling Data

Lab Use Only	Sample #	Results	Remarks
	WO-1		Back storage room, middle wall 3 ft from floor 5 ft off floor
	WO-2		Back storage room Rt wall facing [illegible] underneath A/C
	WO-3		Back storage room (L) wall 3 ft off floor by 2x4 studs
	WO-4		Rt lane, at bullet trap on floor
	WO-5		Middle lane, behind bullet [illegible] on floor
	WO-6		(L) far lane, on floor corner of room
	WO-7		Rt side on wall where green paint starts 3 ft off floor
	WO-8		Lt wall, where white paint starts 5 ft off floor
	WO-9		Rt side on floor at firing [illegible]
	WO-10		Middle lane 15 ft downrange on floor from firing line
	WO-11		Lt lane, on floor 20 ft from firing line
	WO-12		On floor in front of [illegible] entering range

Comments to Lab:

NGB-AVS-SG
SUBJECT: All States (Log Number P01-0075) Army National Guard (ARNG) Safety and Occupational Health Program -- POLICY AND RESPONSIBILITIES FOR INSPECTION, EVALUATION AND OPERATION OF ARMY NATIONAL GUARD INDOOR FIRING RANGES

APPENDIX G
SURFACE WIPE SAMPLING SHEET

Industrial Hygiene Surface Wipe Sample Sheet

Return Address ARNG 301-IH Old Bay Lane Havre de Grace, MD 21078	**Point of Contact** *(name & phone #)* [redacted] 410-942-0273 **Samples Collected By** [redacted]

Sampled Facility	**City**	**State**	**Location** *(bldg/area)*
White Oak	Silver Spring	MD	IFR

Description of Operation	**Date Collected**	**Date Shipped**
Indoor Firing Range	20 Jun 06	20 Jun 06

Analysis Desired
Lead

Sampling Data

Lab Use Only	Sample #	Results	Remarks
	WO-13		On floor in front of door leading outside
	WO-14		On floor at bottom of stairs
	WO-15		On middle of 4th stair leading to basement
	WO-16		At top of stairs on floor
	WO-17		On floor in front of storage room
	WO-18		On floor in front of door leading to armory floor
	WO-19	Blank	
	WO-20	Blank	

Comments to Lab:

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) **150757**

MD

Mailing/Billing Information:
1. Client Name: NATIONAL GUARD BUREAU
2. Address 1: 301-IH OLD BAY LANE
3. Address 2: HAVRE de GRACE, MD 21078
4. Address 3: ______
5. Phone #: 410-942-0273 Fax #: 410-942-0254

Submittal Information:
1. Job Name: White Oak Armory (Silver Springs)
2. Job Location: ______
3. Job #: [redacted] P.O. #: ______
4. Contact Person [redacted] @ phone # 410-942-0273
5. Submitted by: [redacted] Signature: ______

❑ Please include COC/field data sheets with results
Date & Time Results Required: ___/___/___ @ ______

Reporting Information (Results will be provided as soon as technically feasible):
☐ Immd. ☒ 24hr ☐ 48hr ☐ 72hr ☐ 5 Day + ☐ Immd. After-Hours* ☐ 24hr After-Hours* ☐ Late-Night* (*must be pre-scheduled)

❑ Verbals: ______ @ cell # ______ ❑ Fax Copy: ______ @ fax # ______ ❑ Email Copy: ______ @ ______

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
❑ NIOSH 7400 ______ (QTY)
❑ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
❑ AHERA ______ (QTY)
❑ NIOSH 7402 ______ (QTY)
❑ Other (specify ______) ______ (QTY)
PLM Bulk
❑ EPA 600 – Visual Estimate ______ (QTY)
❑ EPA Point Count ______ (QTY)
❑ NY State Friable ______ (QTY)
❑ Grav. Reduction ELAP 198.1 ______ (QTY)
❑ Other (specify ______) ______ (QTY)

TEM Bulk
❑ ELAP 198.4/Chatfield ______ (QTY)
❑ NY State PLM/TEM ______ (QTY)
❑ Residual Ash ______ (QTY)
TEM Dust
❑ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
❑ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
❑ Quan. (s/area)Dust D6480-99 ______ (QTY)
TEM Water
❑ Qual. (pres/abs) ______ (QTY)
❑ ELAP 198.2/EPA 100.2 ______ (QTY)
❑ EPA 100.1 ______ (QTY)

❑ All samples received in good condition unless otherwise noted. (TEM Water samples ______ °C)

Lead Analysis
❑ Paint Chip ______ (QTY)
❑ Dust Wipe (wipe type Ghost) 20 (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)

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)
		20 Jun	N/A	4"x4"				X				X					Date/Time: Contact: By:
WO-13																	
WO-14																	
WO-15																	
WO-16																	Date/Time: Contact: By:
WO-17																	
WO-18																	
WO-19	BLANK																
WO-20	BLANK																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

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) 150757

MD

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Havre de Grace, MD 21078
4. Address 3:
5. Phone #: 410-942-0273 Fax #: 410-942-0254

Submittal Information:
1. Job Name: White Oak Armory (Silver Spring)
2. Job Location:
3. Job #: [redacted] Non-Responsive P.O. #:
4. Contact Perso[redacted] @ phone # 410-942-0273
5. Submitted by:[redacted] Signature:

☐ Please include COC/field data sheets with results
Reporting Information (Results will be provided [redacted] **ble):**
Date & Time Results Required: ___/___/___ @ ______ ☐ Immd. ☒ 24hr ☐ 48hr ☐ 72hr ☐ 5 Day + ☐ Immd. After-Hours* ☐ 24hr After-Hours* ☐ Late-Night* (*must be pre-scheduled)
☐ Verbals: ______ @ cell # ______ ☐ Fax Copy: ______ @ fax # ______ ☐ Email Copy: ______ @ ______

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ NIOSH 7400______(QTY)
☐ Fiberglass______(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ AHERA______(QTY)
☐ NIOSH 7402______(QTY)
☐ Other (specify______)______(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate______(QTY)
☐ EPA Point Count______(QTY)
☐ NY State Friable______(QTY)
☐ Grav. Reduction ELAP 198.1______(QTY)
☐ Other (specify______)______(QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield______(QTY)
☐ NY State PLM/TEM______(QTY)
☐ Residual Ash______(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust______(QTY)
☐ Quan. (s/area) Vacuum D5755-95______(QTY)
☐ Quan. (s/area)Dust D6480-99______(QTY)
TEM Water
☐ Qual. (pres/abs)______(QTY)
☐ ELAP 198.2/EPA 100.2______(QTY)
☐ EPA 100.1______(QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____°C)

Lead Analysis
☐ Paint Chip______(QTY)
☐ Dust Wipe (wipe type Ghost) 20 (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)

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
		[illegible]	N/A	4"x4"				X				X				
WO-01																
WO-02																
WO-03																
WO-04																
WO-05																
WO-06																
WO-07																
WO-08																
WO-09																
WO-10																
WO-11																
WO-12																

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

White Oak IFR

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) [illegible]

Mailing/Billing Information:
1. Client Name: [illegible]
2. Address 1: [illegible]
3. Address 2: [illegible]
4. Address 3:
5. Phone #: [illegible] Fax #: [illegible]

Submittal Information:
1. Job Name:
2. Job Location:
3. Job #: P.O. #:
4. Contact Person: @ phone #
5. Submitted by: Signature:

☑ Please include COC/field data sheets with results
Reporting Information (Results will be provided as soon as technically feasible):
Date & Time Results Required: [illegible] @ [illegible] ☐ Imnd. ☑ 24hr ☐ 48hr ☐ 72hr ☐ 5 Day + ☐ Imnd. After-Hours* ☐ 24hr After-Hours* ☐ Late-Night* (*must be pre-scheduled)
☐ Verbals: @ cell # ☐ Fax Copy: @ fax # ☑ Email Copy: @

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
☐ NIOSH 7400 ___ (QTY)
☐ Fiberglass ___ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
☐ AHERA ___ (QTY)
☐ NIOSH 7402 ___ (QTY)
☐ Other (specify ___) ___ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ___ (QTY)
☐ EPA Point Count ___ (QTY)
☐ NY State Friable ___ (QTY)
☐ Grav. Reduction ELAP 198.1 ___ (QTY)
☐ Other (specify ___) ___ (QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ___ (QTY)
☐ NY State PLM/TEM ___ (QTY)
☐ Residual Ash ___ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ___ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ___ (QTY)
☐ Quan. (s/area) Dust D6480-99 ___ (QTY)
TEM Water
☐ Qual. (pres/abs) ___ (QTY)
☐ ELAP 198.2/EPA 100.2 ___ (QTY)
☐ EPA 100.1 ___ (QTY)

☑ All samples received in good condition unless otherwise noted.
(TEM Water samples ___ °C)

Lead Analysis
☐ Paint Chip ___ (QTY)
☑ Dust Wipe (wipe type [illegible]) 11 (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
WD-100		8/2	N/A	4"x4"				X								
[illegible]																
WD-102																
[illegible]																
WD-104																
[illegible]																
WD-106																
[illegible]																
WD-108																
[illegible]																
WD-110																

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: 8/2/[illegible] @ 9:05 Via: [illegible] By (Print): [illegible] Sign: [illegible]
2. Date/Time Analyzed: / / @ By (Print): Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

BEST AVAILABLE COPY

NGB-AVS-SG
SUBJECT: All States (Log Number P01-0075) Army National Guard (ARNG) Safety and Occupational Health Program -- POLICY AND RESPONSIBILITIES FOR INSPECTION, EVALUATION AND OPERATION OF ARMY NATIONAL GUARD INDOOR FIRING RANGES

APPENDIX G
SURFACE WIPE SAMPLING SHEET

Industrial Hygiene Surface Wipe Sample Sheet

Return Address: NGB Region North IH, 30L 1H Old Bay Lane, Havre De Grace MD 21078

Point of Contact (name & phone #): [redacted] 410-942-0273

Samples Collected By: [redacted]

Sampled Facility	City	State	Location (bldg/area)
White Oak	Silver Spring	MD	IFR

Description of Operation	Date Collected	Date Shipped
Indoor Firing Range	18 July 2006	18 July 2006

Analysis Desired: Lead

Sampling Data

Lab Use Only	Sample #	Results	Remarks
	WO-32		Right lane, at bullet trap on floor
	WO-33		mid lane, at bullet trap on floor
	WO-34		left lane, in corner by bullet trap on floor
	WO-35		right side wall, about 3ft. up. is sample of the green paint. (Bulk.)
	WO-36		right side wall, 3ft up where green paint begins
	WO-37		center lane, 15ft from firing line
	WO-38		left lane, 20ft from firing line
	WO-39		top of stairs, on floor
	WO-40		on floor at door leading to the armory.
	WO-41		just inside door to range, on floor
	WO-42/blank		blank
	WO-43/blank		blank

Comments to Lab: $100 cm^2$ templat used. Please report in $\mu g/ft^2$

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0
NY ELAP 10920
AIHA 100470

Client:	National Guard Bureau	Job Name:	White Oak Armory (Silver Spring)	Chain Of Custody:	148416
Address:	301-IH Old Bay Lane. Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Not Provided	Date Submitted:	7/18/2006
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	[redacted]
		P.O. Number:	Not Provided	Date Analyzed:	7/19/2006
				Report Date:	19-Jul-06

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Final Result			Comments
0667506	WO-32	Flame	Wipe	****	0.111	108.01	ug/ft²		260	ug/ft²	
0667507	WO-33	Flame	Wipe	****	0.111	108.01	ug/ft²		220	ug/ft²	
0667508	WO-34	Flame	Wipe	****	0.111	108.01	ug/ft²		180	ug/ft²	
0667509	WO-35	Flame	Paint Chip	****	N/A	0.01	%Pb		0.026	%Pb	
0667510	WO-36	Flame	Wipe	****	0.111	108.01	ug/ft²		840	ug/ft²	
0667511	WO-37	Flame	Wipe	****	0.111	108.01	ug/ft²		950	ug/ft²	
0667512	WO-38	Flame	Wipe	****	0.111	108.01	ug/ft²		140	ug/ft²	
0667513	WO-39	Flame	Wipe	****	0.111	108.01	ug/ft²		130	ug/ft²	
0667514	WO-40	Flame	Wipe	****	0.111	108.01	ug/ft²		140	ug/ft²	
0667515	WO-41	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0667516	WO-42	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0667517	WO-43	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

NVLAP 101143-0
NY ELAP 10920
AIHA 100470

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	Job Name:	White Oak Armory (Silver Spring)	Chain Of Custody:	148416
Address:	301-III Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Not Provided	Date Submitted:	7/18/2006
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	[redacted]
		P.O. Number:	Not Provided	Date Analyzed:	7/19/2006
Attention:	[redacted]			Report Date:	19-Jul-06

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 samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.
Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: [redacted]   Technical Manager: [redacted]

BEST AVAILABLE COPY

AMA Analytical Services, Inc.
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 148416

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-1H Old Bay Lane
3. Address 2: Havre De Grace, MD 21078
4. Address 3:
5. Phone #: 410-942-0273 Fax #: 410-942-0284

Submittal Information:
1. Job Name: White Oak Armory (Silver Spring)
2. Job Location:
3. Job #: [redacted] P.O. #:
4. Contact Pers[redacted] @ phone # 410-942-0273
5. Submitted by [redacted] Signature [redacted]

☐ Please include COC/field data sheets with results

Reporting Information (Results will be provided as soon as technically feasible):
Date & Time Results Required: 19 / JUL / 06 @ 1330 ☐ Immd. ☒ 24hr ☐ 48hr ☐ 72hr ☐ 5 Day + ☐ Immd. After-Hours* ☐ 24hr After-Hours* ☐ Late-Night* (*must be pre-scheduled)

☐ Verbals: ______ @ cell #: ______ ☐ Fax Copy: ______ @ fax #: ______ ☐ Email Copy: ______ @ ______

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ______ in a 25mm 37mm
☐ NIOSH 7400 ______ (QTY)
☐ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ______ in a 25mm 37mm
☐ AHERA ______ (QTY)
☐ NIOSH 7402 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ______ (QTY)
☐ EPA Point Count ______ (QTY)
☐ NY State Friable ______ (QTY)
☐ Grav. Reduction ELAP 198.1 ______ (QTY)
☐ Other (specify ______) ______ (QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ______ (QTY)
☐ NY State PLM/TEM ______ (QTY)
☐ Residual Ash ______ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
☐ Quan. (s/area)Dust D6480-99 ______ (QTY)
TEM Water
☐ Qual. (pres/abs) ______ (QTY)
☐ ELAP 198.2/EPA 100.2 ______ (QTY)
☐ EPA 100.1 ______ (QTY)

☑ All samples received in good condition unless otherwise noted. (TEM Water samples ______ °C)

Lead Analysis
☒ Paint Chip 1 (QTY)
☒ Dust Wipe (wipe type Ghost) 11 (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)

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	CLIENT CONTACT (LABORATORY STAFF ONLY)
WD-32		[illegible]		4"x4"				X				X					Date/Time: Contact: By:
WD-33												X					
WD-34												X					
WD-35	BULK							X			X						
WD-36												X					Date/Time: Contact: By:
WD-37												X					
WD-38												X					
WD-39												X					
WD-40												X					Date/Time: Contact: By:
WD-41												X					
WD-42	BLANK											X					
WD-43	BLANK											X					

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 7 / 19 / 06 @ 2:00 Via: Walk In By (Print): [illegible] Sign: [illegible]
2. Date/Time Analyzed: ___ / ___ / ___ @ ___ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: Email Date: 7/19/06 Time: ______ Initials: [illegible]
4. Comments:

APPENDIX F

SURFACE WIPE SAMPLING SHEET

Industrial Hygiene Surface Wipe Sample Sheet

Return Address Region North IH 301-IH Old Bay Lane Havre De Grace, MD 21078	**Point of Contact** *(name & phone #)* Non-Responsive [redacted] 410-942-0273 Ext 25 **Samples Collected By** Borckman Non-Responsive [redacted]		
Sampled Facility White Oak	**City** Silver Spring	**State** MD	**Location** *(bldg/area)* IFR
Description of Operation Converted IFR	**Date Collected** 2 Aug 06	**Date Shipped** 2 Aug 06	
Analysis Desired Lead			

Sampling Data

Location	Sample #	Results	Remarks
Right lane (5) at bullet trap on floor	WO-100		
middle lane (3) at bullet trap on floor	WO-101		
left lane (1) at corner near bullet trap	WO-102		
Right wall, 3 ft up from floor where green paint begins	WO-103		
Centerlane (3) 15 ft from firing line	WO-104		
left lane (1) 20 ft from firing line	WO-105		
top of stairs, on floor leading to range	WO-106		
on floor, just inside outer door to range	WO-107		
on floor, just inside range inner door	WO-108		
BLANK	WO-109		
BLANK	WO-110		

Comments to Lab:

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

NVLAP 101143-0 NY ELAP 10920 AIHA 100470

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	White Oak Armory (Silver Spring MD)	**Chain Of Custody:**	150757
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	6/21/2006
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	6/21/2006 **Report Date:** 21-Jun-06

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Final Result			Comments
0659363	WO-01	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659364	WO-02	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659365	WO-03	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659366	WO-04	Flame	Wipe	****	0.111	108.01	ug/ft²		3700	ug/ft²	
0659367	WO-05	Flame	Wipe	****	0.111	108.01	ug/ft²		190	ug/ft²	
0659368	WO-06	Flame	Wipe	****	0.111	108.01	ug/ft²		430	ug/ft²	
0659369	WO-07	Flame	Wipe	****	0.111	108.01	ug/ft²		160	ug/ft²	
0659370	WO-08	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659371	WO-09	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659372	WO-10	Flame	Wipe	****	0.111	108.01	ug/ft²		230	ug/ft²	
0659373	WO-11	Flame	Wipe	****	0.111	108.01	ug/ft²		260	ug/ft²	
0659374	WO-12	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659375	WO-13	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659376	WO-14	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659377	WO-15	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659378	WO-16	Flame	Wipe	****	0.111	108.01	ug/ft²		150	ug/ft²	
0659379	WO-17	Flame	Wipe	****	0.111	108.01	ug/ft²	<	110	ug/ft²	
0659380	WO-18	Flame	Wipe	****	0.111	108.01	ug/ft²		170	ug/ft²	
0659381	WO-19	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0659382	WO-20	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	

An AIHA (#8863), NVLAP (# 101143), & New York ELAP (#10920) Accredited Laboratory
4475 Forbes Blvd. • Lanham, MD 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (301) 459-2643

BEST AVAILABLE COPY

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

NVLAP 101143-0
NY ELAP 10920
AIHA 100470

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	White Oak Armory (Silver Spring MD)	**Chain Of Custody:**	150757
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	6/21/2006
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	6/21/2006 **Report Date:** 21-Jun-06
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.
Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: [redacted]

Technical Manager: [redacted]

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 13104

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	6/21/2006

	Result			Percent Recovery	RPD	Comment
Preparation Blank		-0.015	ppm			Acceptable
Report Limit Verification Sample		0.3027	ppm	90.8%		Acceptable
Expected Spike Level (ppm)	0.3333					
Duplicate Sample 1		#Num!	mg/Kg			
Duplicate Sample 2		#Num!	mg/Kg		#Error	#Error
Matrix Spike Analysis						
Spiked Sample				94.86%		Acceptable
Spike Duplicate						Acceptable
Laboratory Control Sample 1		290.749	µg	101.15%		Acceptable
Laboratory Control Sample 2		295.154	µg	100.21%	0.92%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999106

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
150757	59363	WO-01
150757	59364	WO-02

SDG Number: 13104

BEST AVAILABLE COPY

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
150757	59365	WO-03
150757	59366	WO-04
150757	59367	WO-05
150757	59368	WO-06
150757	59369	WO-07
150757	59370	WO-08
150757	59371	WO-09
150757	59372	WO-10
150757	59373	WO-11
150757	59374	WO-12
150757	59375	WO-13
150757	59376	WO-14
150757	59377	WO-15
150757	59378	WO-16
150757	59379	WO-17
150757	59380	WO-18
150757	59381	WO-19
150757	59382	WO-20

APPENDIX G
SURFACE WIPE SAMPLING SHEET

Industrial Hygiene Surface Wipe Sample Sheet

Return Address ARNG 301-IH Old Bay Lane Havre de Grace, MD 21078	**Point of Contact** *(name & phone #)* [redacted] 410-942-0273 **Samples Collected By** [redacted]

Sampled Facility	**City**	**State**	**Location** *(bldg/area)*
White Oak	Silver Springs	MD	IFR

Description of Operation	**Date Collected**	**Date Shipped**
Indoor Firing Range	20 Jun 06	20 Jun 06

Analysis Desired Lead

Sampling Data

Lab Use Only	Sample #	Results	Remarks
	WO-1		Back storage room, middle wall 2 ft from floor 5 ft off floor
	WO-2		Back storage room Rt wall facing downrange underneath AC
	WO-3		Back storage room (L) wall 7 ft off floor by 2x4 studs
	WO-4		Rt lane, at bullet trap on floor
	WO-5		Middle lane, behind bullet trap on floor
	WO-6		(L) far lane, on floor corner of room
	WO-7		Rt side on wall where green paint starts 3 ft off floor
	WO-8		Lt wall, where white paint starts 5 ft off floor
	WO-9		Rt side on floor at firing line
	WO-10		Middle lane 15 ft downrange on floor from firing line
	WO-11		Lt lane on floor 20 ft from firing line
	WO-12		On floor in front of door entering range

Comments to Lab:

NGB-AVS-SG
SUBJECT: All States (Log Number P01-0075) Army National Guard (ARNG) Safety and Occupational Health Program -- POLICY AND RESPONSIBILITIES FOR INSPECTION, EVALUATION AND OPERATION OF ARMY NATIONAL GUARD INDOOR FIRING RANGES

APPENDIX G
SURFACE WIPE SAMPLING SHEET

Industrial Hygiene Surface Wipe Sample Sheet

Return Address ARNG 301-IH Old Bay Lane Havre de Grace, MD 21078	**Point of Contact** *(name & phone #)* Non-Responsive [redacted] 410-942-0273 **Samples Collected By** Non-Responsive [redacted]

Sampled Facility	**City**	**State**	**Location** *(bldg/area)*
White Oak	Silver Spring	MD	IFR

Description of Operation	**Date Collected**	**Date Shipped**
Indoor Firing Range	20 Jun 06	20 Jun 06

Analysis Desired
Lead

Sampling Data

Lab Use Only	Sample #	Results	Remarks
	WO-13		On floor in front of door leading outside
	WO-14		On floor at bottom of stairs
	WO-15		On middle of 4th stair leading to basement
	WO-16		At top of stairs on floor
	WO-17		On floor in front of storage room
	WO-18		On floor in front of door leading to armory floor
	WO-19	Blank	
	WO-20	Blank	

Comments to Lab:

LOCKER INFO TOP & Bottom

11/18 SILVER SPRING IFR

A: Top B: Bottom shelf

20051118SIL Q1 - locker, plenum wall, 1st inside door
Sgt Henghan

Q2 locker, Row 3, 1st locker from plenum
locker # 130

Q3 locker, Row 4, 9 lockers from wall
on trap end, locker # 129

Q4 locker, Row 3, 5 lockers from wall
on trap end, locker # 086 SPC Hersberger

Q5 locker, Row 3, 10 lockers from wall
on trap end, locker 039

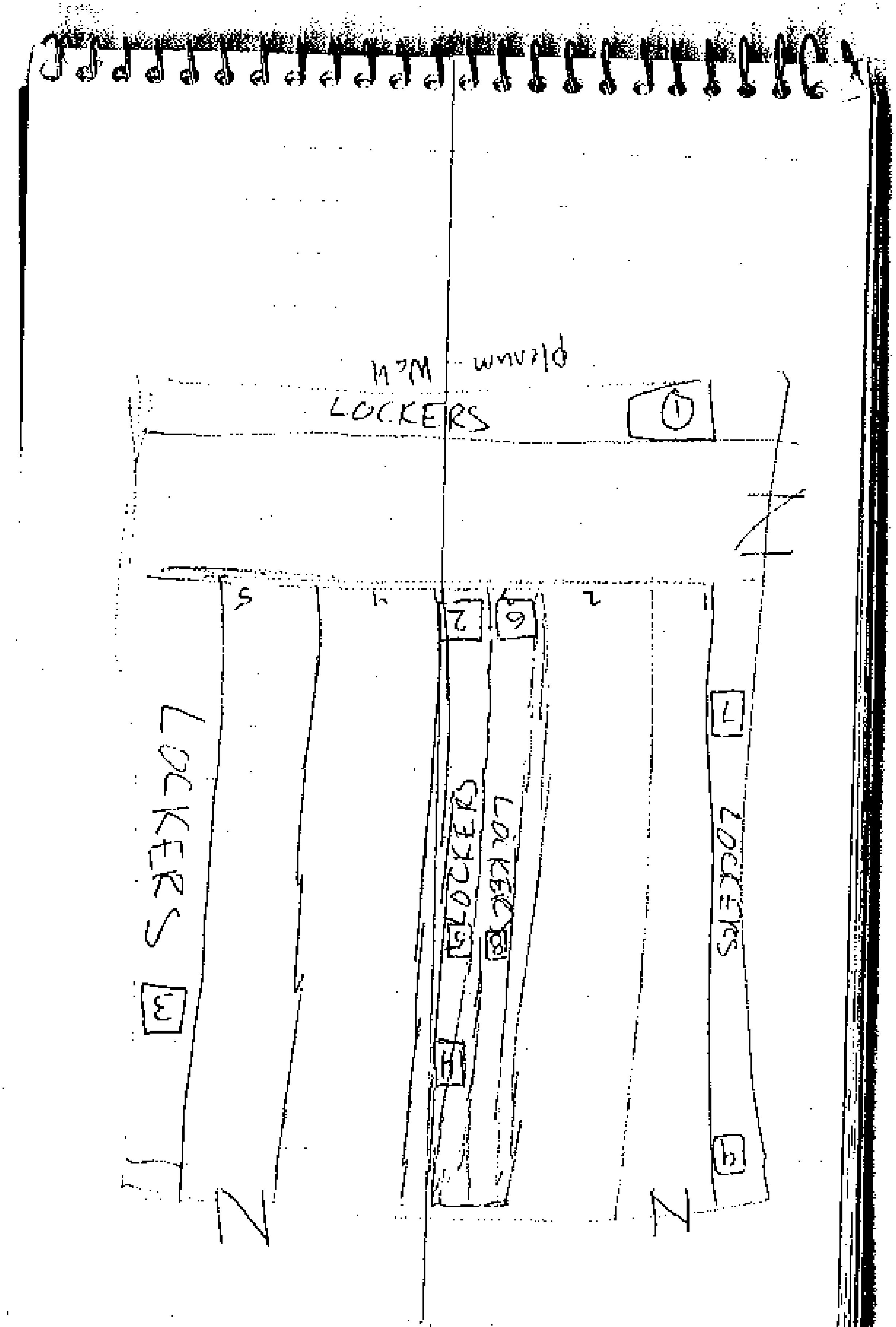
Q6 locker, Row 2, 1st locker from plenum
wall, locker 013

Q7 locker, Row 1, 3rd locker from plenum
wall, locker 052

Q8 locker, Row 2, 13th locker from plenum
wall, locker # 025

Q9 locker, Row 1, locker nearest wall on
trap end, locker # 042 PFC Sasielson

10 BLANK


LOCKERS
1
LOCKERS
3
LOCKERS
LOCKERS
LOCKERS

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) 136295

Mailing/Billing Information:
1. Client Name: NGB Region North 1H
2. Address 1: 301-1H Old Bay Lane
3. Address 2: Havre de Grace MD 21078
4. Address 3:
5. Phone #: 410 942 0773 x25 Fax #: 410 942 0254

Submittal Information:
1. Job Name: SILVER SPRING LOCKERS
2. Job Location: SILVER SPRING ARMORY
3. Job #: P.O. #:
4. Contact Person [redacted] @ phone # 410 942 0773 x
5. Submitted by: [redacted] Signature: [redacted]

☐ Please include COC/field data sheets with results

Reporting Information (Results will be provided as soon as technically feasible):
Date & Time Results Required: 11 / / 05 @ 1000 ☐ Immd. ☐ 24hr ☐ 48hr ☐ 72hr ☒ 5 Day + ☐ Immd. After-Hours* ☐ 24hr After-Hours* ☐ Late-Night* (*must be pre-scheduled)
☐ Verbals: @ cell # ☐ Fax Copy: @ fax # ☐ Email Copy: @

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
☐ NIOSH 7400 ___ (QTY)
☐ Fiberglass ___ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
☐ AHERA ___ (QTY)
☐ NIOSH 7402 ___ (QTY)
☐ Other (specify ___) ___ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ___ (QTY)
☐ EPA Point Count ___ (QTY)
☐ NY State Friable ___ (QTY)
☐ Grav. Reduction ELAP 198.1 ___ (QTY)
☐ Other (specify ___) ___ (QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ___ (QTY)
☐ NY State PLM/TEM ___ (QTY)
☐ Residual Ash ___ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ___ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ___ (QTY)
☐ Quan. (s/area)Dust D6480-99 ___ (QTY)
TEM Water
☐ Qual. (pres/abs) ___ (QTY)
☐ ELAP 198.2/EPA 100.2 ___ (QTY)
☐ EPA 100.1 ___ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ___ °C)

Lead Analysis
☐ Paint Chip ___ (QTY)
☒ Dust Wipe (wipe type Ghost) 20 (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)

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
20051118SIL01A		11/18/05		4"x4"				X				X				
20051118SIL01B																
20051118SIL02A																
20051118SIL02B																
20051118SIL03A																
20051118SIL03B	BLANK															
20051118SIL04A	BLANK															
20051118SIL04B																
20051118SIL05A																
20051118SIL05B																
20051118SIL06A																
20051118SIL06B																
20051118SIL07A																

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: 11 / 21 / 05 @ 1000 Via: Fed EX By (Print): Kadian Watson Sign: K Watson
2. Date/Time Analyzed: / / @ By (Print): Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

BEST AVAILABLE COPY

BULK SAMPLE DATA

For use of this form see USAERA TG 141; the proponent is HSHB-I.O.

Return Address (complete address including Zip Code)
National Guard Bureau, 301 III Old Bay Lane, Attn: NGB-AVN-SI
State Military Reservation, Havre De Grace MD 21078

Point of Contact (name/AUTOVON)
Mr [redacted]
410-942-0273 Ext 18

Sampled Installation
MG George M. Gelston Armory

Project Number

ARLOC

Samples Collected By
[redacted]

Date Collected
30SEP04

Date Shipped

Description of Operation
Decommissioned Firing Range

Location (BLDG/AREA)
Range

Associated Complaints (be specific)

Associated Air Samples
☐ Yes ☒ No

If yes, list sample numbers

Label Information

Trade Name	NSN	Manufacturer

Address

MSDS Attached
☐ Yes ☐ No

Analysis Desired
Lead wipes - Furnace method

Lab Use Only	Sample No.	Constituents	Results	Remarks
	GFL093004 001			Floor - Carpet, right side near bullet trap (Training Room)
	GFL093004 002			Floor-Cement, middle of floor nearing firing line, where locker used to be.
	GFL093004 003			Floor, locker room left aisle under light nearest trains door
	GFL093004 004			Training Rm, Rt wall, on top of wall heater
	GFL093004 005			Top of ceiling tile, to the tile just right and one toward middle wall

Comments to Lab

(Continued on other side)

Lab Use Only

Analyst (initials)	Reviewed By (initials)	Date Received	Date Reported

Procedures Performed

Comments:

AEHA Form 8-R, 1 Oct 84

BULK SAMPLE DATA

Lab Use Only	Sample No.	Constituents	Results	Remarks
	GEL093004 006			OUTSIDE RANGE DOOR by STAIRS, FLOOR
	GEL093004 007			COMPUTER VTC, TOP BACK IN TRAINING RM by WALL
	GEL093004 008			LOCKER, TOP, PRENT.ICE, LEFT WALLSIDE, MID ROOM
	GEL093004 009			LOCKER, TOP, [illegible], Plenum wall side, 3rd Row RT wall
	GEL093004 010			LOCKER, TOP, Chem lkrs, RT wall side, on firing line
	GEL093004 011			BLANK
	GEL093004 012			Plenum wall, cement, white box, low by door
	GEL093004 013			Plenum wall, Above locker, Plenum, high, towards rt. wall
	GEL093004 014			Rear wall, training Rm, left side, in middle
	GEL093004 015			REAR WALL, TRNG RM, MIDDLE OF wall low
	GEL093004 016			REAR WALL, TRNG RM, Right side, high
	GEL093004 017			MIDDLE TRAINING WALL, TRNG ROOM SIDE, MIDDLE LOW
	GEL093004 018			MIDDLE TRNG WALL, LOCKER SIDE, RT of RT door, middle
	GEL093004 019			Right wall, above rt. locker, mid wall, middle (TRNG Room)
	GEL093004 020			Right WALL, LOCKERS, near Trng wall side, past 3 lockers, low
	GEL093004 021			Right wall, LOCKER ROOM, Firing line, high
	GEL093004 022			Left wall, TRNG ROOM, near rear wall, middle
	GEL093004 023			Left wall, LOCKER Rm, near Middle wall, middle
	GEL093004 024			Left wall, LOCKER ROOM high, above Firing line
	GEL093004 025			BLANK
	GEL093004 026			BLANK

BEST AVAILABLE COPY

AMA Analytical Services, Inc.
AIHA (#8863) NVLAP (#1143) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 130319

Mailing/Billing Information:
1. Client Name: Army National Guard
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Havre de Grace, MD 21078
4. Address 3: ____
5. Phone #: ____ Fax #: ____

Submittal Information:
1. Job Name: White Oak
2. Job Location: Silver Spring, MD
3. Job #: [redacted] P.O. #: ____
4. Contact Person: ____ @ phone # 301-677-3688
5. Submitted by: ____ Signature: ____

Reporting Information (Results will be provided as soon as technically feasible):
Date & Time Results Required: ____ @ ____ ☐ Immd. ☐ 24hr ☐ 48hr ☐ 72hr ☐ 5 Day ☐ Immd. After-Hours* ☐ 24hr After-Hours* ☐ Late-Night* (*must be pre-scheduled)
☐ Verbals: ____ @ cell # ____ ☒ Fax Copy: Cindy Harrison @ fax # 301 677 7132 ☐ Email Copy: ____ @ ____

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ NIOSH 7400____(QTY)
☐ Fiberglass____(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ AHERA____(QTY)
☐ NIOSH 7402____(QTY)
☐ Other (specify____)____(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate____(QTY)
☐ EPA Point Count____(QTY)
☐ NY State Friable____(QTY)
☐ Grav. Reduction ELAP 198.1____(QTY)
☐ Other (specify____)____(QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield____(QTY)
☐ NY State PLM/TEM____(QTY)
☐ Residual Ash____(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust____(QTY)
☐ Quan. (s/area) Vacuum D5755-95____(QTY)
☐ Quan. (s/area)Dust D6480-99____(QTY)
TEM Water
☐ Qual. (pres/abs)____(QTY)
☐ ELAP 198.2/EPA 100.2____(QTY)
☐ EPA 100.1____(QTY)

Please report in: ug/ft²

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 Ghost Wipe) 26 (QTY)

Miscellaneous Analysis
☐ Radon____(QTY)
☐ Other (specify____)____(QTY)

SAMPLE ANALYSIS INFORMATION: CLIENT ID NUMBER	SAMPLE LOCATION	DATE	VOLUME (LITERS)	WIPE AREA	ANALYSIS: TEM	PCM	PLM	LEAD	OTHER	MATRIX: AIR	BULK	WIPE	WATER AND OTHER	CLIENT CONTACT (LABORATORY STAFF ONLY)
GEL-093004-001				4x4										Date/Time: Contact: By:
GEL-093004-002														
GEL-093004-003														
GEL-093004-004														
GEL-093004-005														Date/Time: Contact: By:
GEL-093004-006														
GEL-093004-007														
GEL-093004-008														
GEL-093004-009														Date/Time: Contact: By:
GEL-093004-010														
GEL-093004-011	Blank													
GEL-093004-012														
GEL-093004-013														

LABORATORY STAFF ONLY (CUSTODY)
1. Date/Time RCVD: ____ @ ____ Via ____ By (Print) ____ Sign: ____

EBS 1-800-552-0317 108333 210 REV. 11.03

AMA Analytical Services, Inc.
AIHA (#8863) NVLAP (#1143) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 130319

Mailing/Billing Information:
1. Client Name: Army National Guard
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Havre de Grace, MD 21078
4. Address 3:
5. Phone #: Fax #:

Submittal Information:
1. Job Name: White Oak
2. Job Location: Silver Spring, MD
3. Job #: P.O. #:
4. Contact Person [redacted] @ phone # 301-677-3688
5. Submitted by: Signature:

Reporting Information (Results will be provided as soon as technically feasible):
Date & Time Results Required: ___/___/___ @ ___ ☐ Immd. ☐ 24hr ☐ 48hr ☐ 72hr ☐ 5 Day ☐ Immd. After Hours* ☐ 24hr After Hours* ☐ Late Night* (*must be pre-scheduled)
☐ Verbals: ___ @ cell ___ ☒ Fax Co[redacted] fax # 301- ☐ Email Copy: ___ @ ___

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
☐ NIOSH 7400 ___ (QTY)
☐ Fiberglass ___ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ___ in a 25mm 37mm
☐ AHERA ___ (QTY)
☐ NIOSH 7402 ___ (QTY)
☐ Other (specify ___) ___ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ___ (QTY)
☐ EPA Point Count ___ (QTY)
☐ NY State Friable ___ (QTY)
☐ Grav. Reduction ELAP 198.1 ___ (QTY)
☐ Other (specify ___) ___ (QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ___ (QTY)
☐ NY State PLM/TEM ___ (QTY)
☐ Residual Ash ___ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ___ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ___ (QTY)
☐ Quan. (s/area)Dust D6480-99 ___ (QTY)
TEM Water
☐ Qual. (pres/abs) ___ (QTY)
☐ ELAP 198.2/EPA 100.2 ___ (QTY)
☐ EPA 100.1 ___ (QTY)

Please report in: ug/ft²

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 Ghost wipe) 26 (QTY)

Miscellaneous Analysis
☐ Radon ___ (QTY)
☐ Other (specify ___) ___ (QTY)

SAMPLE ANALYSIS INFORMATION / ANALYSIS / MATRIX / CLIENT CONTACT

CLIENT ID NUMBER	SAMPLE LOCATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	OTHER	AIR	BULK	WIPE	WATER AND OTHER	(LABORATORY STAFF ONLY)
[illegible]														Date/Time: Contact: By:
GEL-093004-015														
[illegible]														
GEL-093004-017														
[illegible]														Date/Time: Contact: By:
GEL-093004-019														
[illegible]														
GEL-093004-021														
[illegible]														Date/Time: Contact: By:
GEL-093004-023														
[illegible]														
GEL-093004-025	BLANK													
[illegible]	BLANK													

LABORATORY STAFF ONLY (CUSTODY)
[illegible]

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP NY ELAP AIHA

Client:	National Guard Bureau	**Job Name:**	White Oak	**Chain Of Custody:**	130319	**Report Date:**	12-Oct-04
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Silver Spring, MD	**Date Submitted:**	10/1/2004		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	BPA #W912K6-04-A0002	**Date Analyzed:**	10/12/2004		

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
0500409	GEL 093004 001	Furnace	Wipe	****	0.111	5.40	ug/ft²	36	ug/ft²	
0500410	GEL 093004 002	Flame	Wipe	****	0.111	108.01	ug/ft²	2700	ug/ft²	
0500411	GEL 093004 003	Furnace	Wipe	****	0.111	67.51	ug/ft²	540	ug/ft²	
0500412	GEL 093004 004	Furnace	Wipe	****	0.111	135.01	ug/ft²	900	ug/ft²	
0500413	GEL 093004 005	Furnace	Wipe	****	0.111	135.01	ug/ft²	850	ug/ft²	
0500414	GEL 093004 006	Flame	Wipe	****	0.111	108.01	ug/ft²	1400	ug/ft²	
0500415	GEL 093004 007	Furnace	Wipe	****	0.111	2.70	ug/ft²	21	ug/ft²	
0500416	GEL 093004 008	Furnace	Wipe	****	0.111	33.75	ug/ft²	150	ug/ft²	
0500417	GEL 093004 009	Furnace	Wipe	****	0.111	13.50	ug/ft²	77	ug/ft²	
0500418	GEL 093004 010	Furnace	Wipe	****	0.111	67.51	ug/ft²	410	ug/ft²	
0500419	GEL 093004 011	Furnace	Wipe Blank	****	N/A	0.30	ug	0.57	ug	
0500420	GEL 093004 012	Furnace	Wipe	****	0.111	33.75	ug/ft²	140	ug/ft²	
0500421	GEL 093004 013	Furnace	Wipe	****	0.111	5.40	ug/ft²	38	ug/ft²	
0500422	GEL 093004 014	Furnace	Wipe	****	0.111	2.70	ug/ft²	8	ug/ft²	
0500423	GEL 093004 015	Furnace	Wipe	****	0.111	2.70	ug/ft²	12	ug/ft²	
0500424	GEL 093004 016	Furnace	Wipe	****	0.111	2.70	ug/ft²	4.7	ug/ft²	
0500425	GEL 093004 017	Furnace	Wipe	****	0.111	2.70	ug/ft²	5.2	ug/ft²	
0500426	GEL 093004 018	Furnace	Wipe	****	0.111	2.70	ug/ft²	5.6	ug/ft²	
0500427	GEL 093004 019	Furnace	Wipe	****	0.111	2.70	ug/ft²	8.1	ug/ft²	
0500428	GEL 093004 020	Furnace	Wipe	****	0.111	5.40	ug/ft²	38	ug/ft²	

BEST AVAILABLE COPY

AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP
NY ELAP
AIHA

Client:	National Guard Bureau	**Job Name:**	White Oak	**Chain Of Custody:**	130319	**Report Date:**	12-Oct-04
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Silver Spring, MD	**Date Submitted:**	10/1/2004		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	BPA #W912K6-04-A0002	**Date Analyzed:**	10/12/2004		

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments
0500429	GEL 093004 021	Furnace	Wipe	****	0.111	67.51 ug/ft²	260 ug/ft²	
0500430	GEL 093004 022	Furnace	Wipe	****	0.111	2.70 ug/ft²	9 ug/ft²	
0500431	GEL 093004 023	Furnace	Wipe	****	0.111	5.40 ug/ft²	28 ug/ft²	
0500432	GEL 093004 024	Furnace	Wipe	****	0.111	67.51 ug/ft²	440 ug/ft²	
0500433	GEL 093004 025	Furnace	Wipe Blank	****	N/A	0.30 ug	0.47 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.

Analyst: [redacted] Technical Manager: [redacted]

An AIHA (#8863), NVLAP (# 101143), & New York 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

NVLAP 101143-0
NY ELAP 10920
AIHA 100470

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	Silver Spring Lockers	**Chain Of Custody:**	136295
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Silver Spring Armory	**Date Submitted:**	11/21/2005
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	11/23/2005
				Report Date:	28-Nov-05
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result		Comments
0609957	20051118SIL01A	Furnace	Wipe	****	0.111	67.51	ug/ft²	360	ug/ft²	
0609958	20051118SIL01B	Furnace	Wipe	****	0.111	337.55	ug/ft²	2800	ug/ft²	
0609959	20051118SIL02A	Furnace	Wipe	****	0.111	13.50	ug/ft²	69	ug/ft²	
0609960	20051118SIL02B	Furnace	Wipe	****	0.111	67.51	ug/ft²	360	ug/ft²	
0609961	20051118SIL03A	Furnace	Wipe	****	0.111	13.50	ug/ft²	35	ug/ft²	
0609962	20051118SIL03B	Furnace	Wipe	****	0.111	67.51	ug/ft²	550	ug/ft²	
0609963	20051118SIL04A	Furnace	Wipe	****	0.111	33.75	ug/ft²	150	ug/ft²	
0609964	20051118SIL04B	Furnace	Wipe	****	0.111	67.51	ug/ft²	220	ug/ft²	
0609965	20051118SIL05A	Furnace	Wipe	****	0.111	67.51	ug/ft²	280	ug/ft²	
0609966	20051118SIL05B	Furnace	Wipe	****	0.111	67.51	ug/ft²	560	ug/ft²	
0609967	20051118SIL06A	Furnace	Wipe	****	0.111	13.50	ug/ft²	33	ug/ft²	
0609968	20051118SIL06B	Furnace	Wipe	****	0.111	13.50	ug/ft²	79	ug/ft²	
0609969	20051118SIL07A	Furnace	Wipe	****	0.111	13.50	ug/ft²	59	ug/ft²	
0609970	20051118SIL07B	Furnace	Wipe	****	0.111	67.51	ug/ft²	340	ug/ft²	
0609971	20051118SIL08A	Furnace	Wipe	****	0.111	13.50	ug/ft²	40	ug/ft²	
0609972	20051118SIL08B	Furnace	Wipe	****	0.111	13.50	ug/ft²	87	ug/ft²	
0609973	20051118SIL09A	Furnace	Wipe	****	0.111	13.50	ug/ft²	37	ug/ft²	
0609974	20051118SIL09B	Furnace	Wipe	****	0.111	13.50	ug/ft²	39	ug/ft²	
0609975	20051118SIL10A	Furnace	Wipe Blank	****	N/A	0.30	ug	0.47	ug	
0609976	20051118SIL10B	Furnace	Wipe Blank	****	N/A	0.30	ug	0.34	ug	

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP Accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

An AIHA (#8863), NVLAP (# 101143), & New York 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

NVLAP 101143-0 | NY ELAP 10920 | AIHA 100470

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	**Job Name:**	Silver Spring Lockers	**Chain Of Custody:**	136295
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Silver Spring Armory	**Date Submitted:**	11/21/2005
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	11/23/2005 **Report Date:** 28-Nov-05

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7421; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)

%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: [redacted]

Technical Manager: [redacted]

An AIHA (#8863), NVLAP (# 101143), & New York ELAP (#10920) Accredited Laboratory

4475 Forbes Blvd. • Lanham, MD 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (301) 459-2643