Chapter 14: Cleaning -



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,

Chapter 14: Cleaning

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

Chapter 14: Cleaning



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

VII. Alternative Methods

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

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

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

A. Vacuums

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

B. Trisodium Phosphate and Other Detergents

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

Table	14 1	Initial	Cleaning	Wine-Test	Failure	Rates for	Various	Abatement	Strategies
labic	17.1	million	cicaring	vvipc-icst	i anui c	Rates IOI	various	Abatement	Juaccyles

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.

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

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

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

14–23

MDARNG IH Baseline Surveys, Project No. 55-ML-01ED-03-05

APPENDIX F

RECOMMENDATIONS

F-1

DUNDALK ARMORY RECOMMENDATIONS

The Department of Defense Instruction (DODI) 6055.1 provides Risk Assessment Codes (RAC) for Health Hazards, a procedure that 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 DODI 6055.1 also provides RACs for Safety and Ergonomic Hazards. The RAC for this armory for Lead Exposure is classified as 4. The RAC for Asbestos Exposure is classified as 3. The RAC for Illumination is classified as 5. The RAC for Safety Hazards is classified as 5. The RAC for Ventilation is classified as 1.

1. Lead Exposure. RAC 4.

a. Develop a written Lead Hazard Management Plan for Dundalk Armory.

b. Clean all areas where sampling results showed elevated levels of lead, especially in the converted indoor firing range area that is currently being used for storage. Comprehensive guidelines for cleaning are in Appendix E. Consult with the Maryland Armory Environmental Coordinator concerning disposal requirements after cleanup.

c. Address all potential lead hazards before continuing to extend the use of this facility for children. If children will continue to use this facility, clean surfaces to the EPA and State of Maryland dust-lead standards for young children of 40 μ g/ft² on floors and 250 μ g/ft² for dust-lead on window sills.

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

e. Stabilize the deteriorated paint on the walls.

f. There is the potential that lead contamination could be taken home. Wear disposable chemical-resistant gloves and disposable coveralls as extra protection when working in areas identified as having elevated levels of lead.

g. Test drinking water from water fountains and faucets for lead.

2. Asbestos Exposure. RAC 3. Continue with ongoing asbestos renovation activities.

3. Illumination. RAC 5. Increase lighting levels in SFC Miller's office to 28-46 foot candles to conform to Illuminating Engineering Society of North America guidelines.

4. Safety Hazards. RAC 5. Address fire and trip hazard on drill floor. The drill floor was full of equipment due to the ongoing renovation and abatement.

5. Ventilation. RAC 5. Investigate operating problems with air handling systems. Consider re-surveying indoor air conditions in hot weather with windows closed and systems fully operational.

F-3

MDARNG IH Baseline Surveys, Project No. 55-ML-01ED-03-05

APPENDIX G

SITE MAPS

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2116 of 5269



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APPENDIX H

MOLD GUIDANCE

H-1

Army Facilities Management Information Document on Mold Remediation Issues

TG 277 FEBRUARY 2002



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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

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

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

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

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

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

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

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

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

REMEDIATION PLANNING

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

REMEDIATE MOISTURE AND MOLD PROBLEMS

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

REMEDIATION PROCEDURES

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

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

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

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

FOUR REMEDIATION LEVELS

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

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

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

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

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

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

Contaminated materials that cannot be cleaned should be sealed and doublebagged 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 doublebagged 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.

TG 277

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 doublebagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

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

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

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

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft²) follow Level I guidance for PPE and containment and for a areas (>10 ft²) follow Medium (Level II) or when greater than 100 ft² follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

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

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

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

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

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

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

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

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

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

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

The following procedures are recommended:

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

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

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

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

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

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

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

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

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

HAZARD COMMUNICATION

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

CONCLUSION

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

REFERENCES

- 1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.
- 2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.
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- 7. Occupational Safety & Health Administration. *Respiratory Protection Standard*, 29 Code of Federal Regulations 1910.134. 63 FR 1152. January 8, 1998.
- 8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force*, AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

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

Water Damage Cleanup and Mold Prevention

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

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

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P				
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 			

Ξ

£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.

These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

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

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

APPENDIX B

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

Mold Remediation Guidelines

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

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

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

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*					
Material or Furnishing Affected Cleanup Methods† Personal Protective Equipment Containment					
	SMALL - Total S	urface Area Affected Less Than 10 square	feet (ft ²)		
Books and papers	3				
Carpet and backing	1, 3				
Concrete or cinder block	1, 3	Minimum N-95 respirator, gloves, and goggles			
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3				
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		None required		
Upholstered furniture & drapes	1, 3				
Wallboard (drywall and gypsum board)	3				
Wood surfaces	1, 2, 3				

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

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

Disposable Protective Clothing

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

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

APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

Containment Tips

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

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

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

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

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278 February 2002



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Table of Contents

Introduction
Safety Tips While Investigating And Evaluating Mold And Moisture Problems
Communicate With Building Occupants At All Stages Of Process, As Appropriate 3
Routine Investigation And Evaluation Of Moisture And Mold Problems
Assessments Requiring Sampling 3
References 4
APPENDIX A: Mold Investigation Decision Logic
APPENDIX B: Mold Remediation Guidelines8
APPENDIX C: Personal Protective Equipment11
APPENDIX D: Containment Guidance13

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

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

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

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

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination².

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

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

Communicate with building occupants at all stages of process, as appropriate¹.

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

Routine Investigation and Evaluation of moisture and mold problems³.

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

Assessments Requiring Sampling

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

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

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination².

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air⁴. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control⁴."
Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program. For further mold assistance, contact USACHPPM, Industrial Hygiene Field Services Program, DSN 584-3118 or (410) 436-3118.

References

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

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

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

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

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

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

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

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

APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

MOLD INVESTIGATION DECISION LOGIC



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MOLD INVESTIGATION DECISION LOGIC NOTES:

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

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

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

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

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

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities³. Confirm negative pressure with smoke tubes.

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

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

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

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

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

APPENDIX B

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

Mold Remediation Guidelines

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

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

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

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

TG 278

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

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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.

Feb 02

APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

Containment Tips

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

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

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

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

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2156 of 5269



Industrial Hygiene Study

National Guard Facility Dundalk Readiness Center 2101 North Point Blvd. Dundalk, MD 21222

Prepared for:

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

Prepared by:

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

Report Date: December 18, 2008

Project ID: IHMO080101.03



Senior Industrial Hygienist



Manager, Charlotte Operations

TABLE OF CONTENTS

Executive Summary	3
Operation Description	4
Noise	4
Lead Testing	4
Lighting	5
Indoor Air Quality	6
Suspect ACBM	8
Maintenance Bay	8
Ventilation Assessment	8
Limitations	8
References	9

List of Appendices

Appendix A:	Photographs
Appendix B:	Laboratory Analysis Report

2

EXECUTIVE SUMMARY

An industrial hygiene survey was conducted July 29, 2008 at the Readiness Center Facility Identification No. 492 located in Dundalk, 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, and four (4) of the five (5) surface samples collected were found to have detectable levels of lead.

Indoor air quality parameters were also evaluated during the assessment. Indoor air quality was found to be within those parameters established by the Environmental Protection Agency (EPA) and American Society of Heating, Refrigerating, and Air-conditioning Engineers, Inc. (ASHRAE). The firing range is inactive, having been converted into a classroom, but could have contributed to lead contamination in areas adjacent to the old firing range.

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 Dundalk Readiness Center primarily serves as an equipment storage facility and is equipped to conduct light vehicle maintenance. The facility consists of a single story response center that contains a maintenance bays, office spaces, classrooms, a kitchen area, an assembly hall, boiler room, locker rooms, and unit storage areas.

The exterior walls of the building were constructed of a concrete block system (CBS) finished with red brick. The interior walls were composed of concrete block and in some areas were finished with drywall. The roof of the facility consisted of a built up roof system covered with stone. The heating, ventilating, and air conditioning system (HVAC) consisted of a split direct-expansion (DX) system and several window unit air conditioners. The floors were composed of a poured concrete slab and in some areas were finished with vinyl floor tiles. The ceilings were generally composed of wood deck and in some areas were finished with a suspended drop ceiling system. In many areas a spline ceiling panel system is located above a drop down grid ceiling tile system.

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

Noise Survey

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

Lead Testing

At the time of the assessment, no activities were observed which may lead to lead exposure other than ammunition handling. The facility contains an indoor firing range that was converted to a classroom and storage area. Several areas containing a painted ceiling were found to be in poor condition due to humidity damaged delaminated paint.

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

Lead Testing	Results Su	Immary		
Location	Air ug/m ³	Surface ug/ft ²	Bulk	Chip %Pb
Classroom (Old Range)	ND			
Classroom (Old Range)	ND			
Blank	ND			
Wall in Old Range		ND		
Kitchen- Top of Refrigerator		1700		
Old Supply Duct- Arms Range		15000		
Top of Locker- Room S-2		49		
COC Supply Room- Top of Shelf		200		
Blank		ND		
NCO Club: Window				0.17%
COC Supply Room: Ceiling				3.6%
Criteria	50	200	5,000	0.5
Kovi: ND None Detected				

Key: ND – None Detected

PB – Lead

Detectable levels of lead were identified in the former range supply vent, kitchen, Supply Room and locker room. The National Guard Bureau currently utilizes 200 ug/ft² as a benchmark for identifying contaminated surfaces. In the" Derivation of Wipe Surface Screening Levels for Environmental Chemicals", the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft² is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, HUD levels of 40 μ g/ft² on floors and 250 μ g/ft² on windowsills should be observed.

No detectable levels of lead were identified in those air samples collected. Currently, OSHA observed an 8-hour time weighted average of 50 ug/m³.

Deteriorated paint was observed throughout the facility. Delaminated paint was mostly due to age along with prolonged exposure to elevated humidity levels. Lead-based paint chips were identified in the COC Supply Room.

<u>Lighting</u>

A lighting assessment was conducted throughout the facility. The survey was conducted with large bay doors closed. Measurements were collected using a Cooke

5

Cal-Light 400L Precision Light Meter (Serial No. 98047EL). The light meter was last calibrated on February 22, 2008. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Su	rvey Assessment S	Summary	
Location	Foot Candles	Recommended Lighting	Sufficient Lighting
HHC Supply Room	61-74	30	Yes
HHC TNG Office	68-77	30-50	Yes
COC Supply Room	7-22	30	NO
Office in COC Supply Room	77-85	30-50	Yes
Latrine	38-44	5	Yes
HHC ORD Room	34-61	30-50	Yes
NCO Club	82-105	10	Yes
Main Entrance Foyer	32-40	10	Yes
Conference Room	28-35	30-50	Yes
REC and RTN	25-30	30-50	Yes
Room S-3	28-37	30-50	Yes
Office in Room S-2	38-49	30-50	Yes
BN Pack	32-41	30-50	Yes
Chapel and Adjacent Office	30-41	30-50	Yes
Hall to Classroom	33	5	Yes
Classroom (Old Range)	90-110	30-50	Yes
Locker Room	15-31	7	Yes
SGT. Office	21-34	30-50	Yes

Insufficient lighting was identified in the COC Supply Room.

Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTrak IAQ Meter, Model 8550 (Serial No. 11050). The IAQ Meter was last calibrated in January 2008.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2007). ASHRAE specifies temperature and relative humidity ranges for human comfort (ASHRAE 55-2004). The US Army Technical Guide 277 Army Facilities Management Information 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 72.5°F to 85.1°F with relative humidity readings ranging from 43.5% to 64.5%. The results of the testing for relative humidity exceeded the US Army guidelines in two (2) of the fourteen (14) locations tested.

During the survey, CO_2 levels ranged from 466 ppm to 635 ppm within the facility compared to an outdoor CO_2 level of 397 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,097 ppm (397 ppm + 700 ppm). The results of the testing met the ASHRAE guidelines.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Drill Floor	80.6	57.6	483	0
Class Room	80.3	58.7	475	0
Locker Room	80.3	60.9	466	0
Room BN S-4	72.5	51.1	604	0
Room S-2/S-4	73.4	43.5	635	0
Rec/Ret	73.5	51.9	607	0
Conference Room	77.0	64.5	559	0
NCO Club	74.3	50.1	528	0
Supply Room	81.5	56.9	579	0
PLI Room/Gym	81.3	55.3	473	0
HHC ORD	82.4	52.3	529	0
HHC Training Room	75.2	49.8	584	0
Mess PLT Storage	80.6	55.1	469	0
Outdoors	85.1	46.8	397	0
Criteria	73.0-79.0	30-50	<1,097	<9.0

IAQ Assessment Summary

Elevated humidity levels were identified in the locker room and Conference Room. The locker room was thought to have elevated humidity due to insufficient exhaust. No source of moisture intrusion or wetted materials could be identified in the Conference Room.

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

• Paint was observed to be delaminating from the supply room and weight room. Laboratory analysis of the paint chips collected revealed detectable levels of lead. Delaminating appears to be due to prolonged periods of elevated humidity. • Water impacted ceiling tiles were identified throughout the facility from apparent roof leaks. Roofing tar was identified in several exterior gutter downspouts indicating recent roofing repairs.

Suspect Asbestos Containing Building Materials

Suspect asbestos containing materials include sheetrock/joint compound, floor tiles and associated mastic, splined ceiling pane system, dropped in ceiling panel system and vinyl covebase. Thermal system insulation was found to be paper wrapped fiberglass with PVC and mudded fittings.

Maintenance Bay

The maintenance bay was found to contain a local exhaust ventilation system which was not operable. The Maintenance Bay is used for vehicle storage and on the day of the site visit was being used as a carpentry shop.

The maintenance bay was found to contain custodial items, tools, waste motor oil, ladders and flammable storage cabinet. The flammable storage cabinet contained various paints and cleaning solvents.

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

Ventilation System Assessment

The facility was found to boiler operated radiant heating and window unit air conditioners. A closed system boiler is located in the boiler room.

The LEV system located in the garage was not operable at the time of the assessment. The system consists of one main fan and two flex duct branches.

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,

8

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.

<u>References</u>

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

Appendix A

Photographs



Exterior view of the facility



Delaminated paint located in COC Supply Room





View of delaminated paint weight room (drawing COC PL1)



View of two ceiling tile systems



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View of TSI





FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2170 of 5269



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Appendix B

Laboratory Analysis Report



An AHIA (#100470), NYLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

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Industrial Hygiene Survey

National Guard Facility Dundalk Armory 2101 North Point Blvd. Dundalk, MD 21222

Prepared For:

Survey Location:

Dundalk Armory 2101 North Point Blvd. Dundalk, MD 21222

Havre de Grace, MD 21078

301-IH Old Bay Lane

Prepared By:

Analytical Laboratory Services, Inc. 3544 North Progress Avenue Suite 100 Harrisburg, PA 17110

National Guard Bureau Region North IH

Survey Date:

August 5, 2010

Report Date: August 30, 2010

ALSI Project #: 1008504



Director, Environmental Health & Safety

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

2

Section 1.0 Executive Summary

Section 1.0 Executive Summary

An industrial hygiene survey was conducted August 5, 2010, at the Readiness Center Facility located at 2101 North Point Blvd., Dundalk, MD 21222. The study was performed by Ms

1. Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft^2 in the converted firing range on the ledge of cutout in wall.

Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft². Damaged paint should be repaired and properly remediated.

- Lighting levels met the minimum recommended guidelines in all but three areas:
 1) Room 110, 2) Kitchen, 3) Co 128 BSB Supply Room, 4) S1 Office, 5) S3 Office. Lighting should be improved in these areas. It should be noted that lights in some areas were missing light bulbs. These should be replaced.
- 3. Indoor air quality parameters of temperature, relative humidity carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment. Relative humidity exceeded the recommended ceiling of 60% and temperature exceeded the recommended criteria of 79 degrees F in some indoor locations. There is 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.
- 4. In the garage an overhead vehicle exhaust system is present but not in operation. The motor has been removed. We recommend that the ventilation system be repaired and utilized if vehicle maintenance activity is performed in this facility that would require the use of the overhead vehicle exhaust system.

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Section 2.0 Operation Description & Observations

Section 2.0 Operation Description & Observations

The Dundatk Armory serves as an office setting and equipment storage facility. The facility consists of offices, a drill hall, garage, and storage areas. There are approximately 20-25 full-time employees stationed at the facility.

The building was initially constructed in 1970s. The exterior of the building is brick. The interior walls are primarily concrete block with some areas finished with drywall. 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 other flooring. The ceifings were generally composed of metal roof deck and 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 as an office and gym facility.

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

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

Section 3.0 Noise Survey

Section 3.0 Noise Survey	

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

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Section 4.0 Lead Testing

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At the time of the assessment, no activities were observed which would generate lead exposure. The facility contains a gym and 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.

Sample #	Location	Air ug/m ³	Surface (g/ft ²	Paint Chip %Pb
I	Drill Hall	<4		
2	S4 Office	<3.6		
3	Blank	<3 ug	· · · · · · · · · · · · · · · · · · ·	
4	Supply Room - Chipping Paint			0.11
4	from Ceiling			
5	Room 110 - Top of Bookshelf		<110	
6	Lobby - Top of Heater on Wall		<110	·
7	Drill Hall - Floor		<110	
8	Drill Hall Top of Soda Machine		<110	
9	Drill Hall - Table Top		<110	
10	Lounge - Top of Fireplace		<110	
i	Kitchen - Floor		<110	
12	Kitchen Top of Locker		<110	
	Communications Room - Top of		<110	1
	Filing Cabinet		· · · · · · · · · · · · · · · · · · ·	
	Supply Room Top of Locker		160	÷
15	S3 Office Top of Desk		<110	1
16	Attached Garage Table Top		<110	
17	Converted Firing Range - Floor		<110	1
18	Converted Firing Range Ledge of Cutout in Wall		380	
19	Converted Firing Range – Fan Vent on Wall		<110	
20	Floor Outside Converted Firing Range		<110	
2i	S4 Office Top of Glass Cabinet		<110	<u> </u>
22	Blank		<12 ug].
Criteria		50	200	0.5

Lead Testing Results Summary

____ . . .

Key: Bolded results exceed listed criteria

Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft^2 in the converted firing range on the ledge of cutout in wall.

The National Guard Bureau currently utilizes 200 ug/ft² as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for Environmental Chemicals," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft² is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft² on floors and 250 ug/ft² on windowsills should be observed. There is no child care provided at this facility.

Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 ug/m³. In fact, no detectable level of lead was identified in the air samples collected.

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

Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2 . The damaged paint in the supply room should be repaired and properly remediated.

Section 5.0 Lighting

Section 5.0 Lighting

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

Location .	Foot Candles	Recommended Lighting	Sufficient Lighting
Room 110	18.3	30-50	No
Lounge	65.3	30-50	Yes
Co 128th BSB - Orderly Room	43.5	30-50	Yes
Kitchen	30.0	50	No
Drill Hall	30.8	30-50	Yes
Co 128th BSB - Supply Room	24.7	30	No
Communications Room	66.1	30-50	Yes
S4 Office	87.0	30-50	Yes
(Converted Firing Range)		· ··· ··	•
Office	65.5	30-50	Yes
(Converted Firing Range) Gym	49,2	30	Yes
S1 Office	13.3	30-50] <u>No</u>
S3 Office	21.1	30-50] No
Recruiting Office	30.0	30-50	Yes
Medical Supply	31.5	30	Yes
Attached Garage	171.8	75] Yes

Light Survey Assessment Summary

Lighting levels met the minimum recommended guidelines in all but three areas: 1) Room 110, 2) Kitchen, 3) Co 128 BSB Supply Room, 4) S1 Office, 5) S3 Office. Lighting should be improved in these areas. It should be noted that lights in some areas were missing light bulbs. These should be replaced.

Section 6.0 Indoor Air Quality

Section 6.0 Indoor Air Quality

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

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

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 70.9 to 83.4 degrees F with relative humidity readings ranging from 35.2% to 71.5%. During the survey, carbon dioxide (CO₂) levels ranged from 426 ppm to 1.364 ppm within the facility compared to an outdoor CO₂ level of 428 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO₂ recommended is 1.128 ppm (428 ppm - 700 ppm). Carbon monoxide (CO) ranged from 0.0 - 0.2 ppm.

The following table summarizes the measurements collected.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	83.7	63.0	439	0.2
Room 110	83.4	60,3	465	0.0
Lounge	78.0	57.2	539	0.0
Co 128 th BSB – Orderly Room	75.2	40,9	1,038	0.0
Kitchen	79.5	68,4	513	0.0
Drill Hall	82.4	65.9	429	0.0
Co 128 th BSB - Supply Room	83.4	63.4	436	0.0
Communications Room	76.7	35.2	521	3.6
S4 Office	75.1	49.4	775	0.0
Converted Firing Range Office	75.7	51.3	599	0.0
Converted Firing Raoge Gym	73.7	59.4	586	0.0
S1 Office	75.4	53.1	1,364	0.0
S3 Office	70.9	39.6	650	0.2
Recruiting Office	73.1	57.1	500	0.0

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Medical Supply	80.1	71.5	656	0.1
Attached Garage	82.2	67.4	426	0.0
Outdoors	86,0	59.8	417	0.0
Criteria	73.0-79.0	30-60	<1,128	<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.

Carbon dioxide levels exceeded the recommended ceiling of 1,128 ppm in one location (S1 Office). This suggests that outdoor air ventilation is inadequate in this area. There is no mechanical ventilation system for this facility. No outdoor air ventilation is introduced into the building via the HVAC system.

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 ceiling tiles were observed in approximately 8-10 locations. No current water leaks were noted. It was reported that the water stains were from past water leaks that have been repaired.
- 2. There was a musty type of odor noted in Office S-4. The source of the odor could not be determined.
- 3. Workers in the Medical Supply Area reported that there is often condensation present on surfaces. The area seems hot and humid. There is no air-conditioning in this area.
- 4. No areas of fungal growth were observed.

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

Section 7.0 Suspect Asbestos Containing Building Materials

Section 7.0 Suspect Asbestos Containing Building Materials

Suspect asbestos containing materials (ACM) include sheetrock/joint compound, plaster wall and ceiling systems, floor tiles and associated mastic, and vinyl cove base. Thermal system insulation which is most likely a combination of paper wrapped fiberglass with PVC elbows and well as pre-formed TS1 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. $9^{\circ} \ge 9^{\circ}$ vinyl floor tile and mastic was observed in the kitchen under the sink. This was in good condition.
- 2. 12" x 12" vinyl floor tile and mastic was observed throughout the facility. This was in good condition.

Section 8.0 Maintenance Bay

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Section 8.0 Maintenance Bay

There is a garage area at this facility. It is used for small repair and maintenance jobs. No maintenance activity was in progress at the time of this survey.

A three-drop, overhead vehicle exhaust system is present but not in operation. The motor has been removed.

We recommend that the ventilation system be repaired and utilized it vehicle maintenance activity is performed in this facility that would require the use of the overhead vehicle exhaust system.

Section 9.0 Limitations

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Section 9.0 Limitations

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

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

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Appendix A Laboratory Analysis Report

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Appendix B. Photographs

Appendix B Photographs



Photo I: Exterior view, front.



Photo 2: Exterior view, front.



Photo 3: Exterior view, attached garage.



Photo 4: Interior view, attached garage.



Photo 5: Echausi base in bay, anached garage; currently non-functional.



Photo 6: PPE in attached garage.

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Photo 7: Room 110; damage to possible ACM coiling the



Photo 8: Drill Hall.





Photo 10: Supply Room; damaged chipping paint on ceiling.



Photo 11: Boiler.



Photo 12: Boiler room, chipping paint on ceiling,



Photo 13: Standing water on floor dripping from pipe on boiler.



Photo 14: Converted firing range (gym).



Photo 15: Converted firing range (office).

Appendix C Floor Plans



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2215 of 5269 BEST AVAILABLE COPY

Appendix D References

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Appendix D. References

- 1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead
- 2. American Conference of Governmental Industrial Hygichists (ACGIH) Threshold Limit Values and Biological Exposure Indices, 2010 Edition
- 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
- 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)]
- 9. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)
- The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation

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

MCHB-TS-OFS

May 2004

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

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03 SGT. BG Louis G Smith Armory, Easton MD

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

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

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



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Industrial Hygienist Industrial Hygiene Field Services Program



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



MDARNG FACILITIES IH BASELINE SURVEY BG LOUIS G SMITH ARMORY EASTON, MD 55-ML-01ED-03

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

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

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

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

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

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

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

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

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

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

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

EXECUTIVE SUMMARY MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS, BG LOUIS G SMITH ARMORY EASTON, 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 45.3 % to 50.2 % met the ASHRAE recommended guidelines for air quality of 30%- 60% relative humidity. The indoor temperatures ranged from 74.4 to 75.9 degrees Fahrenheit. They were within the ASHRAE recommended guidelines for an acceptable thermal environment of 73-79 degrees Fahrenheit in the summer and 68-74.5 degrees Fahrenheit in the winter at 50 % relative humidity. All indoor carbon dioxide levels met the ASHRAE recommended guidelines. The indoor carbon dioxide levels ranged from 397- to 432 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 level should not exceed approximately 350 ppm. Therefore the total carbon dioxide level should not exceed approximately 1050 ppm in this armory.

b. Lead. In the drill area, the walls are brick and acoustical tile. There is no paint in this area. All air samples were below the laboratory analytical detection limit for lead in air of 3.0 to 15.0μ g/m³ as well as the Occupational Health and Safety Administration (OSHA) standard of 50μ g/m³ for lead in air. Three dust-lead wipe sample results, located on the floor of the former IFR, exceeded the USACHPPM recommended decontamination level of 200μ g/ft² for dust-lead on frequently contacted surfaces (200 to 1100μ g/ft²) (photos 1593, 1594, and 1595). Paint sampling was conducted for deteriorated paint. One sample was from the paint on the wall and ceiling in the kitchen, above and to the right of the sink (photo 1598). The result was 0.009 % lead which is below the laboratory detectible limits of 0.01 %. The other sample was from the wall where the acoustical stops and cmu starts. The result was 0.017 % which is below the lead-based paint standard of 0.5 % but above detection limits and is referred to as lead-contaminated paint.

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. The RAC for Lead Exposure

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EXSUM, MDARNG Facilities IH Baseline Surveys, BG Louis G Smith Armory, Easton MD Project No. 55-ML-01ED-03

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. Repair and stabilize deteriorated paint on walls. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities. These workers are required to be in compliance with the OSHA lead in construction standard 29 CFR 1926.62. There is a potential for personnel taking lead contamination out of the workplace into their vehicles and homes. Wear disposable gloves and disposable coveralls as extra protection when working in areas identified as having elevated levels of lead. Test drinking water from water fountains and faucets for lead. Address all potential lead hazards before extending this facility to use for children. If children will be using this facility, clean surfaces to the EPA dust-lead standards for young children of $40\mu g/ft^2$ on floors and $250\mu g/ft^2$ for dust-lead on window sills.

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MDARNG Facilities IH Baseline Surveys, BG Louis G Smith Armory, Easton MD Project No. 55-ML-01ED-03

TABLE OF CONTENTS

Paragraph

Page

1.	AUTHORITY	.1					
2.	PURPOSE OF EVALUATION	.1					
3.	BACKGROUND INFORMATION	.1					
4.	SUMMARY OF ACTIONS	.1					
5.	ASSESSMENT CRITERIA FOR LEAD	.2					
6.	SAMPLING RESULTS	.2					
7.	DISCUSSION AND CONCLUSIONS	.3					
8.	RECOMMENDATIONS	.4					
9.	ADDITIONAL ASSISTANCE	.4					
En	closure	.5					
Appendices							
Δ	- ASSESSMENT CRITERIA FOR LEAD A	_1					

A ASSESSMENT CRITERIA FOR LEAD	A-1
B SITE MAPS	B-1
C PHOTOGRAPHS	C-1
D SAMPLING SHEETS AND LAB ANALYSES	D-1
E REFERENCES	E-1
F LEAD CLEANING GUIDANCE	F-1
G MOLD GUIDANCE	G-1

i



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

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

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

LOCATION: BG Louis G Smith Armory, Easton MD

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

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

3. BACKGROUND INFORMATION.

- a. Armory Mission. Light Infantry. Changing to Anti Armor Unit.
- b. Date of Construction. 1975.
- c. POC. SGM Non-Responsive (410) 974-7400 Cell (443) 277-4923 and Mr.
- d. Survey Date. 26 August 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. Sample results and locations are in Appendix D.

b. Physical Condition of Facilities.

(1) Paint. Staff Sergeant^{Non-Responsive}, Environmental Compliance Assessment Coordinator for the MD NGB, stated that there are no records of lead-based paint abatement. The paint was deteriorated in Room 107 (Library) (photo # 1602).

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2224 of 5269 MDARNG Facilities IH Baseline Surveys, BG Louis G Smith Armory, Easton MD Project No. 55-ML-01ED-03

(2) Asbestos. Staff Sergeant stated that there are no records of an asbestos abatement. No asbestos was observed.

(3) Mold. No mold was observed.

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

c. Training. SSG ^{Non-Responsive} has received HAZCOM and HAZMAT training.

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

e. Heating, Ventilation, and Air-conditioning System. There is a central HVAC system for the entire building.

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

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

h. Converted indoor firing range (IFR). Staff Sergeant Non-Responsive, 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 storage area. There is a new drop ceiling and the old ventilation has been removed.

i. Photographs (Appendix C).

j. Site Maps (Appendix B).

k. Facility use by children. The POC stated that children occupy the armory occasionally when it is rented and twice a year for holiday functions.

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

6. SAMPLING RESULTS.

a. Indoor Air Quality. The outdoor relative humidity was measured as 76.0 %. The outdoor temperature was 86.5 degrees Fahrenheit. The armory relative humidity of 45.3 % to 50.2 % met the ASHRAE recommended guidelines for air quality of 30%- 60% relative humidity. The indoor temperatures ranged from 74.4 to 75.9 degrees Fahrenheit. They were within the

MDARNG Facilities IH Baseline Surveys, BG Louis G Smith Armory, Easton MD Project No. 55-ML-01ED-03

ASHRAE recommended guidelines for an acceptable thermal environment of 73-79 degrees Fahrenheit in the summer and 68-74.5 degrees Fahrenheit in the winter at 50 % relative humidity.

The outdoor carbon dioxide level was 340 ppm. All indoor carbon dioxide levels met the ASHRAE recommended guidelines. The indoor carbon dioxide levels ranged from 397- to 432 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. Lead. All air samples were below the laboratory analytical detection limit for lead in air of 3.0 to 15.0μ g/m³ as well as the Occupational Health and Safety Administration (OSHA) standard of 50μ g/m³ for lead in air. Three dust-lead wipe sample results, located on the floor of the former IFR, exceeded the USACHPPM recommended decontamination level of 200μ g/ft² for dust-lead on frequently contacted surfaces (200 to 1100μ g/ft²). Paint sampling was conducted for deteriorated paint. One result was 0.009ug/ft² which is below laboratory detectible limits of 0.01ug/ft². The other sample result was 0.017 which is below the lead-based paint standard of 0.7ug/ft² but above detection limits and is referred to as lead-contaminated paint.

7. DISCUSSION AND CONCLUSIONS.

a. Indoor Air Quality. The armory relative humidity of 45.3 % to 50.2 % met the ASHRAE recommended guidelines for air quality of 30%- 60% relative humidity. The indoor temperatures ranged from 74.4 to 75.9 degrees Fahrenheit. They were within the ASHRAE recommended guidelines for an acceptable thermal environment of 73-79 degrees Fahrenheit in the summer and 68-74.5 degrees Fahrenheit in the winter at 50 % relative humidity.

All indoor carbon dioxide levels met the ASHRAE recommended guidelines. The indoor carbon dioxide levels ranged from 397- to 432 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. Lead. In the drill area, the walls are brick and acoustical tile. There is no paint in this area. All air samples were below the laboratory analytical detection limit for lead in air of $3.0 \text{ to } 15.0 \mu \text{g/m}^3$ as well as the Occupational Health and Safety Administration (OSHA) standard of $50 \mu \text{g/m}^3$ for lead in air. Three dust-lead wipe sample results, located on the floor of the former IFR, exceeded the USACHPPM recommended decontamination level of $200 \mu \text{g/ft}^2$ for dust-lead on frequently contacted surfaces. The results were 200 to $1100 \mu \text{g/ft}^2$ (photos 1593, 1594, and 1595). Paint sampling was conducted for deteriorated paint. One sample was from

MDARNG Facilities IH Baseline Surveys, BG Louis G Smith Armory, Easton MD Project No. 55-ML-01ED-03

the paint on the wall and ceiling in the kitchen, above and to the right of the sink (photo 1598). The result was 0.009 % lead which is below the laboratory detectible limits of 0.01 %. The other sample was from the wall where the acoustical tile stops and the cmu starts- middle (photo 1596). The result was 0.017 %. This is below the lead-based paint standard of 0.5 % but above detection limits and is referred to as lead-contaminated paint. All the floor dust-lead sample results exceeded the EPA lead exposure levels of $40\mu g/ft^2$ for children for dust-lead on floors. There are significant levels of lead in the converted IFR storage room. Children may be exposed to significant levels of lead from dust-lead, deteriorated lead-based paint, and lead contaminated paint in this facility. AR 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them. Recleaning and sealing former firing range area may further prevent exposures for children under six and for the general workforce.

8. RECOMMENDATIONS. Enclosure.

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

Non-Responsive

INDUSTRIAL HYGIENIST USACHPPM LEAD AND ASBESTOS TEAM LEADER Industrial Hygiene Field Services Program EPA AHERA Asbestos Inspector and Management Planner/ Certification Number MD-070340 EPA Lead Inspector and Lead Risk Assessor/ Certification Number 04-7913 MDARNG Facilities IH Baseline Surveys, BG Louis G Smith Armory, Easton MD Project No. 55-ML-01ED-03

ENCLOSURE

EASTON 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.

a. Clean all areas in and adjacent to the storage room (converted 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. 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. Repair and stabilize deteriorated paint.

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

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

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

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

MDARNG Facilities IH Baseline Surveys BG Louis G Smith Armory, Easton, MD Project No. 55-ML-01ED-03

APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

Subject: Proposed Recommendations for Surface Lead in Armories

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

a. EPA standards (40 CFR 745.227(e)(8)(viii))are not directly applicable because they are developed for floors (40 μ g/ft²), windowsills (250 μ g/ft²) and window troughs (400 μ g/ft²) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

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

c. OSHA used to cite a level of 200 μ g/ft² in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 μ g/ft² is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

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

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

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m³ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

MDARNG Facilities IH Baseline Surveys BG Louis G Smith Armory, Easton, MD Project No. 55-ML-01ED-03

APPENDIX B

SITE MAPS



FLOOR PLAN

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APPENDIX C

PHOTOGRAPHS

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Photo Number	Photo Location
1593	Floor of former IFR
1594 !	Floor of former IFR
1595	Floor where baffle used to be – now weight area
1596	Wall where acoustical stops and cmu starts
1597	Kitchen counter
1598	Wall/ceiling in kitchen
1599	Floor in lobby between bathrooms
160 0 	Desk in Room 105 near window
1601	Wall in Room 103 Recruiter Office
1602	Room 107 Library/ peeling paint

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APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

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			Indeer Range Info					
Wipe Sample #	Armory	City	l Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (µg/ft²)
				Yes		Unknown		
EAWOI	Easton	Easton]				On floor on former IFR near door	200
EAW02	Easton	Easton]			On floor about midway of former IFR	1100
EAW03	Easton	Easton]			On floor where baffle used to be (now weight area)	250
EAW04	Easton	Easton]		_	On counter in kitchen near sink	<[]0
EAW05	Easton	Easton					On floor in lobby between bathrooms	<110
EAW06	Easton	Easton					On desk in Room 105 near window	<110
EAW07	Easton	Easton					On wall in Room 103 recruiter's office near window] <110
EAW08	Easton	Easton					On floor in Room 107 (library) peeling paint above	<10

-



Not Provided

Attention:

Page 1 of 1

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft ²)	Rep L	orting imit	I	final Res	ult	Comments
0366797	EA W01	Flame	Wipe	****	0.108	111.52	ug/ft²		200	ug/ft²	
0366798	EA Blank 01	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0366799	EA W02	Flame	Wipe	****	0.108	111.52	ug/ft²		1100	ug/ft²	
0366800	EA W03	Flame	Wipe	****	0.108	111.52	ug/ft²		250	ug/ft²	
0366801	EA W04	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0366802	EA W05	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0366803	EA Blank 02	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0366804	EA W06	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0366805	EA W07	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0366806	EA W08	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0366807	EA Bulk 01	Flame	Paint Chip	****	N/A	0.01	%Pb		0.017	%Pb	
0366808	EA Bulk 02	Flame	Paint Chip	****	N/A	0.01	%Pb	<	0.009	%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

P.O. Number:

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.

Julloughby

Technical Manager: G Edward Carney

Report Date:

09-Sep-03

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 Posted to NGB FOIA Reading Room An AIHA (#8863), NVLAP (# 101143), & New York ELAP (#10920) Accredited Laboratory Released by National Guard Bureau All rights reserved. AMA Analytical Services, Inc.

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Job Number:

P.O. Number:

Not Provided

Not Provided

Attention:

Page 1 of 1

Summary of Atomic Absorption Analysis for Lead

MA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft ²)	Repo Li	orting imit	I	final Res	ult	Comments	
0366797	EA W01	EA W01	Flame	Wipe	****	0.108	111.52	ug/ft²		200	ug/ft²	
0366798	EA Blank 01	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug		
0366799	EA W02	Flame	Wipe	****	0.108	111.52	ug/ft²		1100	ug/ft²		
0366800	EA W03	Flame	Wipe	****	0.108	111.52	ug/ft²		250	ug/ft*		
0366801	EA W04	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²		
0366802	EA W05	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²		
0366803	EA Blank 02	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug		
0366804	EA W06	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²		
0366805	EA W07	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²		
0366806	EA W08	Flame	Wipe	***	0.108	111.52	ug/ft²	<	110	ug/ft²		
0366807	EA Bulk 01	Flame	Paint Chip	****	N/A	0.01	%РЬ		0.017	%Pb		
0366808	EA Bulk 02	Flame	Paint Chip	****	N/A	0.01	%Pb	<	0.009	%Рь	111	

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

Havre de Grace, Maryland 21078

considered when interpreting the result.

Analyst: Jodi Willoughby

Technical Manager: G Edward Carney

Person Submitting:

Report Date:

09-Sep-03

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. All rights reserved. AMA Analytical Services, Inc.

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SAMPLES





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APPENDIX E

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APPENDIX E

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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.

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

MDARNG Facilities IH Baseline Surveys BG Louis G Smith Armory, Easton, MD Project No. 55-ML-01ED-03

APPENDIX F

LEAD CLEANING GUIDANCE

CHAPTER 14: CLEANING

Ste	ep-by-Step Summary	
I.	Introduction	
	A. Performance Standard	
	B. Small Dust Particles	
	C. Difficulties in Cleaning	
	1. Low Clearance Standards	
	2. Worker Inexperience	
	3. High Dust-Producing Met	nods and/or Inadequate Containment 14–6
	4. Deadlines	
II.	Coordination of Cleaning	Activities 14–6
	A. Checklist	
	B. Equipment Needed for Clear	ing 14–6
	C. Waste Disposal	
III.	Cleaning Methods and Pro	cedures 14–7
	A. Containment	
	B. Basic Cleaning Methods: We	t Wash and Vacuum
	Cleaning Techniques	
	1. HEPA Vacuuming	
	2. Wet-Detergent Wash	
	3. The HEPA/Wet Wash/HE	PA Cycle 14–11
	4. Sealing Floors	
IV.	Order of Cleaning Procedu	res During Lead Hazard Control 14-16
	A. Precleaning Procedures	
	B. Ongoing Cleaning During th	e Job 14–18
	C. Daily Cleaning Procedures	
	1. Large Debris	
	2. Small Debris	
	3. Exterior Cleaning	
	4. Worker Protection Measur	es 14–19
	5. Maintaining Containment	

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Chapter 14: Cleaning

V.	Or	rder of Final Cleaning Procedures After	
	Le	ead Hazard Control 1	4–19
	Α.	Final Cleaning 1	4–19
		1. Decontamination of Workers, Supplies, and Equipment 1	4–19
	В.	Preliminary Visual Examination 1	4–20
	С.	Surface Painting or Sealing of Nonfloor Surfaces 1	4–20
	D.	Final Inspection 1	4–20
	E.	Recleaning After Clearance Failure 1	4–20
VI	Cle	eaning Cost Considerations 1	4–21
	Α.	Initial Clearance Test Failure Rates 1	4–21
	В.	Key Factors In Effective Cleaning 1	4–21
	C.	Special Problems 1	4–21
VI	I. A	Alternative Methods 1	4–22
	Α.	Vacuums 1	4–22
	В.	Trisodium Phosphate and Other Detergents 1	4–22

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Step-by-Step Summary



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



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

Chapter 14: Cleaning

I. Introduction

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

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

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

A. Performance Standard

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

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning

procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

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

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

1. Low Clearance Standards

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

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

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

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


2. Worker Inexperience

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

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

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

4. Deadlines

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

II. Coordination of Cleaning Activities

A. Checklist

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

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?

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

B. Equipment Needed for Cleaning

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



C. Waste Disposal

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

III. Cleaning Methods and Procedures

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

A. Containment

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

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

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

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

Although HEPA filtered vacuums and 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 finedust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.



Operating Instructions

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

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

Special Attachments

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

Selecting Appropriate Size(s)

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

Wet-Dry HEPA Vacuums

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

Prefilters

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

HEPA Vacuuming Procedures

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

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

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

Emptying the HEPA Vacuum

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



Parts of a HEPA-vacuum

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

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

2. Wet Detergent Wash

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

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



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



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

Manufacturer's Dilution Instructions

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

Appropriate Cleaning Equipment

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

Proper Wet-Cleaning Procedures

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

Changing Cleaning Mixture

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



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

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

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

✤ First, the area is HEPA vacuumed.



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Chapter 14: Cleaning

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

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

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

Single-Pass Wet Wash/HEPA Vacuum

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



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14–13 FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2260 of 5269

Figure 14.4c (continued)

Wash all surfaces with suitable detergents

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



Wipe All Surfaces



Wet Mop Floor



Don't Dry Sweep

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Figure 14.4d (continued)

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

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



4. Sealing Floors

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

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

IV. Order of Cleaning Procedures During Lead Hazard Control

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

A. Precleaning Procedures

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



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

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



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



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

B. Ongoing Cleaning During the Job

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

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will



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

return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

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

1. Large Debris

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

2. Small Debris

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

3. Exterior Cleaning

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

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6mil 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 plasticremoval process usually requires workers to use protective clothing and respirators.

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

1. Decontamination of Workers, Supplies, and Equipment

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

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

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



Figure 14.8a Pick Up Corners of Plastic Sheeting.



Figure 14.8b Fold Plastic Inward.

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

B. Preliminary Visual Examination

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

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

C. Surface Painting or Sealing of Nonfloor Surfaces

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

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

D. Final Inspection

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

E. Recleaning After Clearance Failure

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

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

VI. Cleaning Cost Considerations

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

A. Initial Clearance Test Failure Rates

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

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



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

B. Key Factors In Effective Cleaning

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

C. Special Problems

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

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



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

VII. Alternative Methods

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

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

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

A. Vacuums

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

B. Trisodium Phosphate and Other Detergents

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

Table	14 1	Initial	Cleaning	Wine-Test	Failure	Rates for	Various	Abatement	Strategies
labic	17.1	million	cicaring	vvipc-icst	i anui c	Rates IOI	various	Abatement	Juaccyles

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.

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

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

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

14-23

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APPENDIX G

MOLD GUIDANCE

Army Facilities Management Information Document on Mold Remediation Issues

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

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

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

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

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

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

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

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

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

REMEDIATION PLANNING

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

REMEDIATE MOISTURE AND MOLD PROBLEMS

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

REMEDIATION PROCEDURES

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

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

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

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

FOUR REMEDIATION LEVELS

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

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

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

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

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

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

Contaminated materials that cannot be cleaned should be sealed and doublebagged 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 doublebagged 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.

TG 277

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 doublebagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

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

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

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

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft²) follow Level I guidance for PPE and containment and for a areas (>10 ft²) follow Medium (Level II) or when greater than 100 ft² follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

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

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

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

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

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

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

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

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

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

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

The following procedures are recommended:

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

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

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

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

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

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

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

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

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

HAZARD COMMUNICATION

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

CONCLUSION

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

REFERENCES

- 1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.
- American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.
- New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.
- 4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.
- 5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.
- 6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500*, *Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.
- 7. Occupational Safety & Health Administration. *Respiratory Protection Standard*, 29 *Code of Federal Regulations 1910.134*. 63 FR 1152. January 8, 1998.
- 8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force*, AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

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

Water Damage Cleanup and Mold Prevention

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

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

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

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£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.

These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

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

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

APPENDIX B

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

Mold Remediation Guidelines

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

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

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

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

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

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

Disposable Protective Clothing

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

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

APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

Containment Tips

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

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

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

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

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2294 of 5269

Table of Contents

Introduction
Safety Tips While Investigating And Evaluating Mold And Moisture Problems
Communicate With Building Occupants At All Stages Of Process, As Appropriate 3
Routine Investigation And Evaluation Of Moisture And Mold Problems
Assessments Requiring Sampling 3
References 4
APPENDIX A: Mold Investigation Decision Logic
APPENDIX B: Mold Remediation Guidelines8
APPENDIX C: Personal Protective Equipment11
APPENDIX D: Containment Guidance13

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

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

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

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

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination².

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

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

Communicate with building occupants at all stages of process, as appropriate¹.

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

Routine Investigation and Evaluation of moisture and mold problems³.

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

Assessments Requiring Sampling

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

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

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination².

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air⁴. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control⁴."

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

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

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MOLD INVESTIGATION DECISION LOGIC



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MOLD INVESTIGATION DECISION LOGIC NOTES:

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

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

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

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

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

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities³. Confirm negative pressure with smoke tubes.

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

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

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

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

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

APPENDIX B

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

Mold Remediation Guidelines

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

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

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

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

TG 278

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

Disposable Protective Clothing

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

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

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APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

Containment Tips

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

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

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

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

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene Survey

National Guard Facility Easton Armory 7111 Ocean Gateway Easton, MD 21604

Prepared For:

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

Survey Location:

Prepared By:

Easton Armory 7111 Ocean Gateway Easton, MD 21604

Analytical Laboratory Services, Inc. 3544 North Progress Avenue Suite 100 Harrisburg, PA 17110

Survey Date:

September 16, 2010

November 1, 2010

Report Date:

ALSI Project #: 1009599
Non-Responsive

Director, Environmental Health & Safety

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	Section 1.0 Executive Summary	
	Section 2.0 Operation Description & Observations	
	Section 3.0 Noise Survey	
	Section 4.0 Lead Testing	
	Section 5.0 Lighting	
	Section 6.0 Indoor Air Quality	
	Section 7.0 Suspect Asbestos Containing Building Materials	
	Section 8.0 Maintenance Bay	
	Section 9.0 Limitations	
	Appendix A. Laboratory Analysis Report 14	
	Appendix B. Photographs	
	Appendix C. Floor Plan	
	Appendix D. References	

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Section 1.0 Executive Summary

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on September 16, 2010, at the Easton Armory located at 7111 Ocean Gateway, Easton, MD 21604. The survey was performed by Ms^{Non-Responsive} and Mr.^{Non-Responsive}

- 1. Lead surface and air samples were collected. All sample results were less than recommended guidelines or regulatory standards.
- 2. Lighting levels met the minimum recommended guidelines.
- 3. Relative humidity exceeded the recommended ceiling of 60% and temperature was higher than the recommended criteria of 79 degrees F in many locations. There is no central air conditioning system at this facility. Outdoor conditions were hot and humid and many doors and windows were open. Relative humidity should be maintained at 30-60%. Low relative humidity can lead to the drying of mucous tissues and an increased susceptibility to respiratory infection. High relative humidity can provide an environment suitable for microbial growth and proliferation.
- 4. Water damaged ceilings and active roof leaks are present. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

3

Section 2.0 Operation Description & Observations

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

The building was built in 1975. The exterior is brick. The interior walls are concrete block, brick or drywall. The floors are concrete with some viny! floor tile. Older carpet is present in some offices.

There is an oil-fired boiler providing forced air heat. No central air-conditioning system is present. There are two air handling units (AHU). Outdoor air ventilation occurs via open doors and windows which were open on the day of this survey. A limited inspection of the AHU was performed. The units could not be opened for inspection. Filters were removed and inspected and found to be dirty. AHU are reportedly serviced and the filters are changed two times per year. Portions of the AHU that could be observed were clean and appeared in good condition. The AHU were off for the season.

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

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

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

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.

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Section 4.0 Lead Testing

Section 4.0 Lead T	festing		
		 <u> </u>	

At the time of the assessment, no activities were observed which would generate lead exposure. The facility contains a gym/exercise 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, lnc., 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.

Sample #	Location	Air ug/m ³	Surface ug/ft ²
1	Drill Hall	<4.2	· · · · · · · · · · · · · · · · · · ·
2	Orderly Room #2	<4.3	l
3	Blank	<3 (ug)	
4	Gym Converted Firing Range Floor		 <1 0
5	Gym Converted Firing Range - Top of Locker		<110
6	Gym Converted Firing Range – Tabletop		<110
7	Floor Outside Gym Converted Firing Range	·	<110
8	Drill Hall - Floor (Center)		<110
9	Drill Hall - Top of Bulletin Board		<110
10	Drill Hall – Floor Outside Maintenauce Office		<110
11	Maintenance Office – Top of Refrigerator		<110
12	Orderly Room #2 - Return Grill		<110
13	Commander's Office Top of Filing Cabinet		<110
14	Kitchen – Floor		<110
15	Men's Locker Room Top of Locker		<110
16	Blank		<12 (ug)
Criteria		50	200

Lead Testing Results Summary

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/Ω^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/ tt^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/ tt^2 on floors and 250 ug/ tt^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/m². In fact, no detectable level of lead was identified in the air samples collected.

Section 5.0 Lighting

Section 5.	0 Lighting
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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.

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Orderly Room #2	59.6	30-50	Yes
Classroom	40.5	30-50	Yes
Recruiting Office	77.4	30-50	No
Orderly Room #1	63.0	30-50	Yes
Maintenance Office	64.3	30-50	Yes
Drill Hall	52.3	30-50	Yes
Kitchen	131.7	50	Yes
Men's Locker Room	67.5	7	Yes
Women's Locker Room	107.3	7	Yes
Gym (Converted Firing Range)	32.1	30	Yes

Light Survey Assessment Summary

Lighting levels met the minimum recommended guidelines.

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Section 6.0 Indoor Air Quality

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Section 6.0 Indoor Air Quality

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

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

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 78.1 to 80.4 degrees F with relative humidity readings ranging from 50.8% to 66.5%. During the survey, carbon dioxide (CO₂) levels ranged from 356 ppm to 513 ppm within the facility compared to an outdoor CO₂ level of 372 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO₂ recommended is 1,072 ppm (372 ppm \sim 700 ppm). Carbon monoxide (CO) ranged from 0.0 - 0.1 ppm.

The following table summarizes the measurements collected.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	87.4	56.1	377	0.4
Orderly Room #2	80.4	50.8	474	1.1
Classroom	. 79.2	56.2	513	0.8
Recruiting Office	78.1	57.4	436	0.6
Orderly Room #1	78.3	60.5	433	0.2
Maintenance Office	78.4	60.8	403	0.4
Drill Hall	80.1	65.3	378	0.2
Kitchen	80.2	63.7	386	0.1
Men's Locker Room	79.2	59.3	400	0.4
Women's Locker Room	79.3	63.1	369	0.2
Gym Converted Firing Range	80.4	66,5	356	0.0
Outdoors	87.3	51.3	366	0.0
Criteria	73,0-79.0	30-60	<1,072	<9,0

IAQ Assessment Summary

Key: Bolded results exceed listed criteria
Relative humidity exceeded the recommended ceiling of 60% and temperature was higher than the recommended criteria of 79 degrees F in many locations. There is no central air conditioning system at this facility. Outdoor conditions were hot and humid and many doors and windows were open. 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. Doors and windows were open on the day of this survey.

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

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

- 1. Water damaged ceilings and roof leaks were present in a few areas. There is a current roof leak in the Supply Room ceiling. Efflorescence, which is an indicator of water infiltration, was observed on the block wall in the Drill Hall. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.
- 2. Filters in the AHU were dirty and should be replaced more frequently.

Section 7.0 Suspect Asbestos Containing Building Materials

Section 7.0 Suspect Asbestos Containing Building Materials

No suspect asbestos containing materials (ACM) were observed. No samples were collected. Inaccessible areas were not inspected.

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Section 8.0 Maintenance Bay

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Section 8.0 Maintenance Bay

There is no garage area at this facility.

Section 9.0 Limitations

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Section 9.0 Limitations

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

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

Appendix A Laboratory Analysis Report

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Appendix B Photographs

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2337 of 5269



Eastern MD Exterior



Easton MD Drill Hall



Easton MD Drill Hall - Water Damage on Brick Wall



Easton MD Converted Firing Range (Gym)



Easton MD Boiler Room



Enterior Fresh Air Intake

Appendix C Floor Plan

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2344 of 5269



Appendix D References

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Appendix D. References

- 1. Title 29 Code of Federal Regulations (Cl/R), 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
- 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/ANS1
- 6. RP-7-2001. Industrial Lighting, Illuminating Engineering Society of North America/ANS1
- 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(b)(3)]
- 9. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)
- 10. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation



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

Industrial Hygiene Survey Report

National Guard Facility Easton Readiness Center

Prepared For:	National Guard Bureau Region North IH 301-IH Old Bay Lane
	Havre de Grace, MD 21078
Survey Location:	Easton Readiness Center
	7111 Ocean Gateway
	Easton, MD 21604
Prepared By:	Compliance Management International
	1215 Manor Drive
	Suite 205
	Mechanicsburg, PA 17055
Survey Date:	December 4, 2012
Report Date:	January 22, 2013
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Non-Responsive Senior Industrial Hygienist

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Table of Contents

Section 1.0 Executive Summary
Section 2.0 Operation Description & Observations
Section 3.0 Lead Testing
Section 4.0 Lighting
Section 5.0 Indoor Air Quality
Section 6.0 Suspect Asbestos Containing Building Materials
Section 7.0 Equipment 11
Section 8.0 Limitations
Appendix A. Laboratory Analysis Report
Appendix B. Photographs
Appendix C. Floor Plan
Appendix D. References

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on December 4, 2012, at the Easton Readiness Center located at 7111 Ocean Gateway, Easton, MD 21604. The survey was performed by Mr. Non-Responsive, CIH.

- 1. Lead surface and air samples were collected. Surface levels of lead exceeded 200 micrograms per square foot (ug/ft^2) in one location. Cleaning procedures should be improved and remedial action should be taken to maintain lead levels below 200 ug/ft². See Section 3.0 for sampling results.
- 2. Lighting levels did not meet the American National Standard Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in the Control Room. See Section 4.0 for detailed findings.
- 3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were within recommended guidelines during this survey.

Section 2.0 Operation Description & Observations

The Easton Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, a garage and storage areas. There were approximately 6 full-time employees stationed at this facility at the time of this survey.

The building was initially constructed in 1975. The building is one story with a brick exterior. The interior walls are concrete block or drywall. The floors are concrete with vinyl floor tile or carpet.

There is a central HVAC system present in the facility. HVAC units service the building via a oil fired boiler. The offices have a central air conditioning system..

The firing range has been converted into an exercise room and storage area. It was reported that the remediation of the lead hazards in the firing range had been completed.

There is no child-care facility in the building.

Overall housekeeping practices were good.

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

Section 3.0 Lead Testing

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

Sample #	Location	Air	Surface
-		ug/m	ug/It
1	Room 103- SFC Larry Smith Office	<6.6	*
2	Drill Hall	<6.7	*
3	Drill Hall – Center of Floor	*	<110
4	Drill Hall – Display Cabinet	*	110
5	Drill Hall – Top of Vending Machine	*	<110
6	Drill Hall – Display Cabinet Permanent	*	<110
7	Drill Hall – Return Grill	*	640
8	Converted Firing Range – Floor at Bullet Trap	*	<110
9	Converted Indoor Firing Range – Supply Grill	*	<110
10	Converted Indoor Firing Range – Top of Light	*	<110
11	Converted Indoor Firing Range – Top of Locker	*	<110
12	Converted Firing Range – Floor	*	<110
13	Drill Hall Floor Outside of Converted Firing Range	*	<110
14	Room 115 Locker Room – Top of Locker	*	<110
15	Room 103 Office – Desk	*	<110
16	Room 111 Kitchen – Top of Microwave	*	<110
17	Room 110 – Top of Refrigerator	*	<110
18	Room 108 Office – Desk	*	<110
19	Distance Learning Center – Table	*	<110
20	Blank – Wipe	*	<12 ug
21	Blank – Air	<3 ug	*
-	Criteria	50	200

Lead Testing Results Summary

Table Notes:

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

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

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The National Guard Bureau currently utilizes 200 ug/ft² as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 "Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft² on floors and 250 ug/ft² on windowsills should be observed. There is no child care provided at this facility.

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

 Surface levels of lead were at or above the recommended guideline of 200 ug/ft² in the Drill Hall – Return Grill

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

- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m³).
- There was no chipping or peeling paint observed in the facility.

Section 4.0 Lighting

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

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Room 103 – Office	40.6	30-50	Yes
Room 104 – Office	38.0	30-50	Yes
Room 108 – Office	49.1	30-50	Yes
Distance Learning Center	39.8	30-50	Yes
Control Room	27.8	30	No
Room 109 – Recruitment Office	87.7	30-50	Yes
Room 107 – Maintenance Office	43.5	30-50	Yes
Room 110 – Lounge	40.7	10	Yes
Room 112 – Boiler Room	48.5	30	Yes
Room 111 – Kitchen	106.2	50	Yes
Room 117 – Exercise Room	31.0	30	Yes
Room 115 – Locker Room	71.4	7	Yes
Room 101 – Drill Hall	33.2	10	Yes

Light Survey Assessment Summary

Table Notes:

1. FC = Foot Candles

2. **Bolded** results did not meet listed criteria

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

The lighting level did not meet the minimum recommended guideline in the Control Room. However, the lighting level was within the 10% of the recommend lighting level allowed by ANSI/IESNA RP-1-04 foot note in Table 1. Lighting should be improved in this area.

Section 5.0 Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, carbon monoxide and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7565 (Serial #02041015). The IAQ Meter was last calibrated in August 2012.

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

The following table summarizes the measurements collected.

	L	Polotivo	Carbon	Carbon
T	Temperature			
Location	(∘ F)	Humidity	Dioxide	Nonoxide
	(1)	(%)	(ppm)	(ppm)
Outdoors	71.8	52.2	399	3.7
Room 103 – Office	71.6	46.9	472	2.8
Room 104 – Office	71.2	46.6	468	2.8
Room 108 – Office	72.7	45.6	624	2.8
Distance Learning Center	72.9	47.1	462	2.8
Control Room	73.9	46.2	487	2.5
Room 109 – Recruitment Office	74.8	44.0	517	2.7
Room 107 – Maintenance	72.9	42.9	501	26
Office	/3.8	42.8	521	2.0
Room 110 – Lounge	73.9	47.0	381	2.4
Room 112 – Boiler Room	76.5	44.4	511	2.5
Room 111 – Kitchen	76.8	42.0	488	2.5
Room 117 – Exercise Room	64.8	46.4	398	2.7
Room 115 – Locker Room	68.4	51.0	451	2.4
Room 101 – Drill Hall	73.8	47.6	490	2.4
Outdoors	73.0	51.0	396	2.6
Criteria	68.0-79.0	30-60	<1,098	<9.0

IAQ Assessment Summary

Table Notes:

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

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

Summary of findings and recommendations:

- Temperature and relative humidity measurements were within the recommended guidelines.
- Carbon dioxide levels measured did not exceed the recommended ceiling of 1,098 parts per million (ppm). This indicates that outdoor air ventilation is adequate in all areas.
- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm.
- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. There were no items of concern noted during the survey.

Section 6.0 Suspect Asbestos Containing Building Materials

Based on the age of the building (e.g., constructed in 1975) asbestos-containing materials (ACM) could be present in the facility. No suspect ACM was observed at the time of this survey. Inaccessible areas such as behind walls or crawlspaces were not inspected.

Section 7.0 Equipment

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

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	02041015	8/2012	NA
Cal Light 400 Light Meter	K98364	4/2012	NA
TSI 4199 Calibrator	41460827002	8/2012	NA
SKC Air Sampling Pump	647631	12/3/2012	2.53 LPM
SKC Air Sampling Pump	647610	12/3/2012	2.50 LPM

Section 8.0 Limitations

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

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

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISONEC 17025-2005 www.aibaaccreditectaba.org

LAB #100470

C	lient:	National Guard Bureau	Job Name:	Not Provided	Chain Of Custody:	514700		
A	ldress:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	Job Location:	Not Provided	Date Submitted:	12/10/2012		
		Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	Non-Responsive		
			P.O. Number:	W912K6-09-A-0003	Date Analyzed:	12/16/2012	Report Date:	12/16/2012

Attention:

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Rej	porting Limit	Total ug	Final Res	sult	Comments
13021232	3	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13021233	4	Flame	Wipe	****	0.108	110	ug/ft²	12	110	ug/ft²	
13021234	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/fl²	
13021235	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13021236	7	Flame	Wipe	****	0.108	110	ug/ft²	69	640	ug/ft²	
13021237	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft ²	
13021238	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13021239	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft ²	
13021240	- 11	Flame	Wipe	****	0.108	110	ug/ft ²	<12	<110	ug/ft²	
13021241	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft ²	
13021242	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13021243	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13021244	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13021245	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	32
13021246	17	Flame	Wipe	****	0.108	110	ug/fl²	<12	<110	ug/fl²	
13021247	18	Flame	Wipe	****	0.108	110	ug/fl²	<12	<110	ug/ft²	
13021248	19	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13021249	20	Flame	Wipe Blank	***	N/A	12	ug		<12	ug	

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

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AMA Analytical Services, Inc.

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CERTIFICATE OF ANALYSIS



A Specialized Environmental Laboratory

Client:	National Guard Bureau	Job Name:	Not Provided	Chain Of Custody:	514700			
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	Job Location:	Not Provided	Date Submitted:	12/10/2012			
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	Non-Responsive			
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	12/16/2012	Report Date:	12/16/2012	
Attention:	Non-Responsive							

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AIHA LAP, LLC

NOUSTRIAL HYGIENE, ENVIRONMENTAL LEAD S ENVIRONMENTAL MICROBIOLOGY ISONEC 17025.2005 www.athenic.org/istellation.org LASI #100470

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 Analysis Method Fo	r Flame: Air, Wipes, or Furnace: Air, Wip	Paints, and Soil/S es, Paints, and So	olids: EPA 600/F il/Solids : EPA 6	R-93/200(M)-7000 00/R-93/200(M)-7	0B; Water: SM-311 7010; Water: SM-3	1B See Qe 3113B associa	C Summary for an ated with these	alytical results of quality	control samples

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.

Analyst: Kimberly D. Shipe

ples.

Technical Manager: G Edward Carney

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

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 HMH HACIULICAL Services, Inc. Focused on Results www.amalab.com AIHA (#100470) NVLAP (#101143-0) NY1 4475 Forbes Blvd. • Lanham, MD 20706 (301) 459-2640 • (800) 346-0961 • Fax (301 Mailing/Billing Information: Client Name: <u>National Guard Bureau</u> 	ELAP (10920)) 459-2643	CHAIP	Submittal Information:
2. Address 1: 301-IH Old Bay Lane			2. Job Location
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4. Address 3:Havre da Grace_ Maryland_	21078		4. Contact Person
5. Phone #: (410) 942-0273	Fax #:(410) 942-0	1254	5. Submitted by
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CAsbestos Soil PLM_(Qual) PLM_(Quan) PLMTEM_(Quan) PLMTEM_(Quan) ANALYSIS SAMPLE INFORMATION MATRIX CLIENT CONEACT forb SAMPLE LOCATION/ VOLUME WIPE DATE (LITERS) AREA 3dt WAB CLIENT ID 3 Eko Ta No 2 5 (LABORATORY STAFF ONLY) NUMBER 12/4/12 100 cm? X 13 Ron 117 FLOOR OUT Date/Time: Contact: By: 14 Ru 115 Locker 12/4/12 8 15 12/1/12 Ra-103 DESK en III Kirchen relyla 16 RM 110 FRIDER 12/4/n 17 Date/Time: Contact: By: Rm 108 DLSK r.H/n 18 12/4/1 5 K 19 DLC TADLE 12/4/2 D × NOA SLIGMATER BLANK 20 - NRM × 21 12/4/12 6 1 BLANK ADade/Time: Contact: By: Via: 1. Date/Time RCVD:, @ By (Print): Sign: LABORATORY _By (Print): @ 2. Date/Time Analyzed: Sign:, STAFF ONLY: 3. Results Reported To:_ BEST AVAILABLE COPY Date: FOIA Requested Record #J-15-0085 (MD) Posted to NGBFORReading Roomonneuts: May, 2018

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С	lient:	National Guard Bureau	Job Name:	Easton RC	Chain Of Custody:	514784	
А	ddress:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	Job Location:	Easton, MD	Date Submitted:	12/13/2012	

Attention: Non-Respon

Havre de Grace, Maryland 21078

Summary of Atomic Absorption Analysis for Lead

Page 1 of 1

12/17/2012

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Rep I	oorting .imit	Total ug	Final Res	ult	Comments
13022545	1	Flame	Air	455	N/A	6.6	ug/m³	<3	<6.6	ug/m³	
13022546	2	Flame	Air	450	N/A	6.7	ug/m³	<3	<6.7	ug/m³	
13022547	21	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13022547	21	Flame	Air Blank	0 2-93/200/M\-700(N/A B: Water: SM-31	3 11B	ug/m² See QC	Summary for an	alvtical result	s of quality co	ntrol s

Not Provided

W912K6-09-A-0003

Job Number:

P.O. Number:

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.

Analyst: Suphin Chinnapad

Technical Manager: G Edward Carney

12/17/2012

Report Date:

Person Submitting:

Date Analyzed:

associated with these

samples.

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

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Appendix B. Photographs



Exterior of Building



Drill Hall



Converted Firing Range

Appendix C. Floor Plan



Appendix D. References

- 1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead
- 2. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values and Biological Exposure Indices, 2011 Edition
- 3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition
- 4. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2010
- 5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI
- 6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI
- 7. National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.
- 8. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h)(3)]
- 9. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)
- 10. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.
- 11. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 NOV 06.
- 12. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.



ENCL

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/Non-Responsive, 301-IH Old Bay Lane, Havre de Grace, MD 21078

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

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

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



Industrial Hygienist Industrial Hygiene Field Services Program

n-Responsi



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



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

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

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

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

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

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

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

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

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

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



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, EDGEWOOD ARMORY EDGEWOOD, 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. All measurements met the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) recommended guidelines for indoor air quality. The relative humidity was 46.7 %. The recommended guidelines are between 30 and 60% relative humidity. The indoor temperature of 68.2 degrees Fahrenheit was within the ASHRAE recommended guidelines for an acceptable thermal environment of 73 to 79 degrees Fahrenheit in the summer and 68-74.5 degrees Fahrenheit in the winter at 50 % relative humidity. The outdoor carbon dioxide level was 312 parts per million (ppm). The indoor carbon dioxide level of 313 ppm was within the ASHRAE recommended guidelines.

b. Lead. Five of fourteen dust-lead wipe sample results exceeded the USACHPPM recommended decontamination level of $200\mu g/ft^2$ for dust-lead on surfaces. All five samples were taken from the former indoor firing range (IFR). Personnel using the former IFR may be tracking lead out of the room and redistributing lead into adjacent rooms in the armory. This can result in lead exposures for the general workforce. All water samples are below the EPA National Primary Drinking Water Regulations action level for lead in drinking water of 15 parts per billion (ppb).

c. Mold and Safety. There is both black and white mold on the ceiling. It is possible that mold may also be on the concrete walls throughout the armory. However, the white deposits may be due to efforescence. The POC stated that there has been a problem with condensation on the walls in the armory, and that the water drips onto the floor and presents a slip hazard. To prevent slipping the armory manager has covered all floors in the hallways with rubber mats.

3. 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

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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.

a. Lead. The RAC for Lead Exposure in the former indoor firing range is classified as 5. Clean all areas in and adjacent to the former IFR where sampling results showed significantly elevated levels of dust-lead. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. Apply a sealant to the area. Recleaning and sealing the IFR may further prevent lead from becoming redistributed into adjacent rooms and resulting in exposures for the general workforce. Address all potential lead hazards before extending this facility to use for children, such as participation in family support group activities or sports. If children will use this facility in any capacity, clean surfaces to the EPA dust-lead standard for young children of 40µg/ft² on floors and clean to the USACHPPM decontamination level of 200µg/ft² for dust-lead on all other surfaces. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities in the IFR area. 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 of the IFR identified as having elevated levels of lead.

b. Mold. A RAC has not been assigned to the mold but we recommend this situation be addressed immediately. The mold will have to be abated. Comprehensive guidelines are provided in Appendix G. The HVAC system should be evaluated by an engineer to ensure effective operation.

ES-2

TABLE OF CONTENTS

Pa	ragraph	Page
1.	AUTHORITY	1
2.	PURPOSE OF EVALUATION	1
3.	BACKGROUND INFORMATION	1
4.	SUMMARY OF ACTIONS	1
5.	ASSESSMENT CRITERIA FOR LEAD	2
6.	SAMPLING RESULTS	2
7.	DISCUSSION AND CONCLUSIONS	4
8.	RECOMMENDATIONS	5
9.	ADDITIONAL ASSISTANCE	5

Enclosure

1.	Lead Exposure	6
2.	Mold	6

Appendices

A ASSESSMENT CRITERIA FOR LEAD	A-1
B SITE MAPS	B-1
C PHOTOGRAPHS	C-1
D SAMPLING SHEETS AND LAB ANALYSES	D-1
E REFERENCES	E-1
F LEAD CLEANING GUIDANCE	F-1
G MOLD GUIDANCE	G-1



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

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

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

LOCATION: Edgewood Armory, Edgewood MD

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

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

3. BACKGROUND INFORMATION.

a. Armory Mission. Administration.

b. Date of Construction. Built in 1983.

c. POC. MSG Non-Responsive, armory manager, 410-436-2423 and Ms. , Edgewood Armory employee, 410-612-4198.



d. Survey Dates: 29 April and 25 September 2003.

4. SUMMARY OF ACTIONS.

a. Sampling. Surface dust-lead wipe and water 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. Sample results and locations are in Appendix D.

b. Physical Condition of Facilities.

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(1) Paint. Lead-based paint was not used in this armory. It has been Army policy since 1978 to not use lead-based paint in Army facilities.

(2) Asbestos. No asbestos was installed in this armory.

(3) Mold. There is mold in the armory.

(4) Safety Hazards Condensation collects on the walls and drips onto the floor. This presents a potential slip hazard to the employees so the armory manager installed rubber mats throughout the hallways (photograph # 1038).

c. Building concerns. See Safety Hazards.

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

e. Heating, Ventilation, and Air-conditioning System (HVAC). There is a central HVAC system throughout the armory. There are windows but they cannot be opened.

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). Staff Sergeant Ruth McCuen, Environmental Compliance Assessment Coordinator for the MD NGB, has records that state that lead has been abated in the indoor firing range. However, there are still high levels of dust-lead in the former indoor firing range. The IFR is currently being used for storage. There are plans to use it as an exercise room in the near future.

i. Photographs (Appendix C).

- j. Site Maps. (Appendix B).
- k. Facility use by children. The POC stated that children do not currently use the armory.

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

6. SAMPLING RESULTS.

2

a. Indoor Air Quality. The armory relative humidity of 46.7 % met the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) recommended guidelines for air quality of 30%- 60% relative humidity. The indoor temperature of 68.2 degrees Fahrenheit was within the ASHRAE recommended guidelines for an acceptable thermal environment of 73-79 degrees Fahrenheit in the summer and 68-74.5 degrees Fahrenheit in the winter at 50 % relative humidity. The outdoor carbon dioxide level was 312 parts per million (ppm). The indoor carbon dioxide level of 313 ppm was within the ASHRAE recommended guidelines. 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 was 350 ppm. Therefore the total carbon dioxide level should not exceed approximately 1012 ppm in this armory.

b. Lead. Five of fourteen dust-lead wipe sample results exceeded the USACHPPM recommended decontamination level of $200\mu g/ft^2$ for dust-lead on surfaces. All five samples were taken from the former IFR.

All water samples are below the EPA National Primary Drinking Water Regulations action level for lead in drinking water of 15 parts per billion (ppb).

See Table 1 and Appendix D for dust-lead wipe and water locations, photograph numbers, and analytical results. All sample results that are equal to or exceed $200\mu g/ft^2$ of dust-lead are highlighted.

		,		
Sample	Type of	Location	Photo	Result
Numbers	Sample			μg/ft²
AB W01	Wipe	Drill Floor (near main entrance)	1021	<110
AB W02	Wipe	Drill Floor (middle of floor)	1022	<110
AB W03	Wipe	Drill Floor (near exit to rear of armory)	1023	<110
AB W04	Wipe	Drill Floor (table top on right side of drill	1024	<110
	_	room)		
AB W05	Wipe	Drill Floor (table on left side of drill room)	1025	<110
AB W06	<mark>Wipe</mark>	Former IFR baffle area	<mark>1028</mark>	<mark>8000</mark>
AB W07	Wipe Wi pe	Former IFR middle of floor	<mark>1029</mark>	<mark>260</mark>
AB W08	Wipe Wi pe	Former IFR floor (rear)	<mark>1030</mark>	<mark>850</mark>
AB W09	Wipe Wi pe	Former IFR rear storage room floor	<mark>1031</mark>	<mark>1600</mark>
AB W10	Wipe	Former IFR acoustical wall panel	1032	<110
AB W11	Wipe	Former IFR perforated metal soundproofing	<mark>1033</mark>	<mark>1600</mark>
		panel		
AB W12	Wipe	Window Sill Second Floor	0747	<110
AB W13	Wipe	Air Supply Hallway Second Floor	0748	<110
AB W14	Wipe	Hallway Floor Second Floor next to Entrance	0749	<110
Water				Parts Per
Samples				Billion
ABH2O 01	Water	Women's Bathroom First Floor First Draw		7.9
ABH2O 02	Water	Women's Bathroom First Floor Second Draw		< 1
ABH2O 03	Water	Utility Sink First Floor First Draw		3.1
ABH2O 04	Water	Utility Sink First Floor Second Draw		< 1

1 uolo 1. Dumple Locations, 1 notograph namous, and 1 mary four results

7. DISCUSSION AND CONCLUSIONS.

a. Indoor Air Quality. The armory relative humidity of 46.7 % met 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 68.2 degrees Fahrenheit was within 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. The outdoor carbon dioxide level was 312 parts per million (ppm). The indoor carbon dioxide level of 313 ppm was within the ASHRAE recommended guidelines. 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 was 350 ppm. Therefore the total carbon dioxide level should not exceed approximately 1012 ppm in this armory.

b. Lead. Five of fourteen dust-lead wipe sample results exceeded the USACHPPM recommended decontamination level of $200\mu g/ft^2$ for dust-lead on surfaces. All five samples were taken from the former IFR. Personnel using this room may be tracking lead out of the area and redistributing lead into adjacent rooms in the armory. This can result in lead exposures for the general workforce. All water samples are below the EPA National Primary Drinking Water Regulations action level for lead in drinking water of 15 parts per billion (ppb).

c. Mold and Safety. There is both black and white mold on the ceiling. Mold also appears to be on the concrete walls throughout the armory. However, we have seen other buildings where efforescence occurs and resembles mold. Efforescence is a white crystalline or powdery, often fluffy or fuzzy deposit on the surface of masonry materials such as concrete, brick, clay and tile. It is caused by water seeping through the wall, floor, or object. The water dissolves salts inside the object while moving through it, and then evaporates leaving the salt on the surface. The salt resembles mold growth. The POC stated that there has been a problem with condensation on the walls in the armory. We observed that the front doors and the rear loading doors in the armory are open occasionally. This can cause warm moist air to enter the building. When this air comes into contact with cooler air it forms condensation on the walls. The POC stated that the water drips onto the floor and presents a slip hazard. To prevent slipping the armory manager has covered all floors in the hallways with rubber mats.

8. RECOMMENDATIONS. Enclosure.

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

Non-Responsive

INDUSTRIAL HYGIENIST

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



ENCLOSURE

EDGEWOOD 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.

1. Lead Exposure. The RAC for Lead Exposure in the former indoor firing range is classified as 5. Clean all areas in and adjacent to the former IFR where sampling results showed significantly elevated levels of dust-lead. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. Apply a sealant to the area. Recleaning and sealing the IFR may further prevent lead from becoming redistributed into adjacent rooms and resulting in exposures for the general workforce. Address all potential lead hazards before extending this facility to use for children, such as participation in family support group activities or sports. If children will use this facility in any capacity, clean surfaces to the EPA dust-lead standard for young children of 40µg/ft² on floors and clean to the USACHPPM decontamination level of 200µg/ft² for dust-lead on all other surfaces. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities in the IFR area. 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 of the IFR identified as having elevated levels of lead.

2. Mold. A RAC has not been assigned to the mold but we recommend this situation be addressed immediately. The mold will have to be abated. Comprehensive guidelines are provided in Appendix G: USACHPPM Technical Guide 277 Army Facilities Management Information Document on Mold Remediation Issues, February 2002. The HVAC system should be evaluated by an engineer to ensure effective operation.

APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

Subject: Proposed Recommendations for Surface Lead in Armories

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

a. EPA standards (40 CFR 745.227(e)(8)(viii))are not directly applicable because they are developed for floors (40 μ g/ft²), windowsills (250 μ g/ft²) and window troughs (400 μ g/ft²) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

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

c. OSHA used to cite a level of 200 μ g/ft² in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 μ g/ft² is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

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

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

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m³ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

APPENDIX B

SITE MAPS







• YOU ARE HERE

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Shani Ua

MDARNG Home

NUMA Franci

Maryland Army National Guard — Edgewood Armory

(Directions)

29th Aviation Brigade, 29th Infantry Division (Light)

Building #4305 Aberdeen Proving Grounds Edgewood Area Aberdeen, MD 21010-5401

Call 410-679-3050

Local Recruiters: SSG Non-Responsive and SFC Non-Responsive

Resident Units:

- 29th Aviation Brigade, 29th Infantry Division (Light)
 - Headquiters & Headquarters Company
 - 224th Aviation Regiment
 - Company F (AVIM)
 - Company C (Assault Helicopter), 2nd Battalion
 - 1st Squadron, 158th Cavavlry Regiment (RECON) "The Governor's Guard"
 - Troop B
 - Troop C
 - Troop D
- 29th Air Traffic Control Services Group
 - Headquarters
 - o 129th Air Traffic Services Company (Div)
 - o 104th Medical Company (Air Ambulance)
- MDNG Military Youth Corps (ChalleNGe)
- Mobilization AVCRAD Control Element
- · Operational Support Airlift Detachment

Building #A1060

Organizational Maintenace Shop #11

UNDER CONSTRUCTION

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APPENDIX C

PHOTOGRAPHS

EDGEWOOD ARMORY

Photo Number	Photo Location
1021	Drill Floor (near main entrance)
1022	Drill Floor (middle of floor)
1023	Drill Floor (near exit to rear of armory)
1024	Drill Floor (table top on right side of drill room)
1025	Drill Floor (table on left side of drill room)
1028	Former IFR baffle area
1029	Former IFR middle of floor
1030	Former IFR floor (rear)
1031	Former IFR rear storage room floor
1032	Former IFR acoustical wall panel
1033	Former IFR perforated metal soundproofing panel
0747	Window Sill Second Floor
0748	Air Supply Hallway Second Floor
0749	Hallway Floor Second Floor next to Entrance












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Released by National Guard Bureau Page 2414 of 5269

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

APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

				Indoor Ra	ange li	nfo		
Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (µg/ft²)
				Yes		Yes		
AB W01	Edgewood	Edgewood					Drill Floor (near main entrance)	<110
AB W02	Edgewood	Edgewood					Drill Floor (middle of floor)	<110
AB W03	Edgewood	Edgewood					Drill Floor (near exit to rear of armory)	<110
AB W04	Edgewood	Edgewood					Drill Floor (table top on right side of drill room)	<110
AB W05	Edgewood	Edgewood					Drill Floor (table on left side of drill room)	<110
AB W06	Edgewood	Edgewood					Former IFR baffle area	8000
AB W07	Edgewood	Edgewood					Former IFR middle of floor	260
AB W08	Edgewood	Edgewood					Former IFR floor (rear)	850
AB W09	Edgewood	Edgewood					Former IFR rear storage room floor	1600
AB W10	Edgewood	Edgewood					Former IFR acoustical wall panel	<110
AB W11	Edgewood	Edgewood					Former IFR perforated metal soundproofing panel	1600
AB W12	Edgewood	Edgewood					Window Sill Second Floor	<110
AB W13	Edgewood	Edgewood					Air Supply Hallway Second Floor	<110
AB W14	Edgewood	Edgewood					Hallway Floor Second Floor next to Entrance	<110

BEST A Malytical Services, Inc. CERTIFICATE OF ANALYSIS A Specialized Environmental Laboratory AIHA **Chain Of Custody:** 116953 Job Name: National Guard Client: US Army - CHPPM 10/10/2003 Attn: MCHB-TS-OFS, 5158 Blackhawk Road Job Location: Aberdeen/Edgewood Armoy Date Analyzed: Address: Aberdeen Proving Grounds, Maryland Job Number: Not Provided **Person Submitting:** 21010-5403 P.O. Number: Not Provided **Report Date:** 10-Oct-03 Attention: Page 1 of 1

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft ^x)	Repo Li	rting mit	Fi	n ai Res	ult	Comments	
-												
0401861	ABH2O 01	Furnace	Water	****	N/A	1.00	ug/L		7.9	ug/L		
0401862	ABH2O 02	Furnace	Water	****	N/A	1.00	ug/L	<	1	ug/L		
0401863	ABH2O 03	Furnace	Water	****	N/A	1.00	ug/L		3.1	ug/L		
0401864	ABH2O 04	Furnace	Water	****	N/A	1.00	ug/L	<	1	ug/L		

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

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

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

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

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

Technical Manager: G Edward Carney

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

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Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft ²)	Repo Li	erting mit	F	inal Res	ult	Comments
0400454	ABWBlank I	Flame	Wine Blank	****	N/A	12.00	110	<	12	ug	
0400455	ABW 01	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	-e ug∕ft²	
0400456	ABW 02	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft ²	
0400457	ABW 03	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft ^z	
0400458	ABW 04	Flame	Wipe	****	0.108	111.52	ug/ít²	<	110	ug/ft²	
0400459	ABW 05	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/fl²	
0400460	ABWBlank 2	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0400461	ABW 06	Flame	Wipe	****	0.108	111.52	ug/ft²		8000	ug/ft²	
0400462	ABW 07	Flame	Wipe	****	0.108	111.52	ug/ft²		260	ug/ft²	
0400463	ABW 08	Flame	Wipe	****	0.108	111.52	ug/ît²		850	ug/ft²	
0400464	ABW 09	Flame	Wipe	****	0.108	111.52	ug/ft²		1600	ug/ft²	
0400465	ABW 10	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0400466	ABWBlank 3	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0400467	ABW 11	Flame	Wipe	****	0.108	111.52	ug/ft²		1600	ug/ft²	
0400468	ABWBlank 4	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0400469	ABW 12	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0400470	ABW 13	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0400471	ABW 14	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0400472	ABWBlank 5	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, NYLAP Accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples.

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Page 2418 of 5269

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	Aberdeen Proving Gro 21010-5403	ounds, Maryland	Job Number:	Not Provided		Person Submitting:	Non-Responsive	
			P.O. Number:	Not Provided		Report Date:	02-Oct-03	
Aftention:	Non-Responsive		Summary o	of Atomic .	Absorption A	nalysis for Lead		Page 2 of 2
MA Sample	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments

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

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

APPENDIX E

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APPENDIX E

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

APPENDIX F

LEAD CLEANING GUIDANCE

CHAPTER 14: CLEANING

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

_

V.	Or	der of Final Cleaning Procedures After	
	Le	ad Hazard Control	14–19
	Α.	Final Cleaning	14–19
		1. Decontamination of Workers, Supplies, and Equipment	14–19
	В.	Preliminary Visual Examination	14–20
	С.	Surface Painting or Sealing of Nonfloor Surfaces	14–20
	D.	Final Inspection	14–20
	Ε.	Recleaning After Clearance Failure	14–20
VI	. Cle	eaning Cost Considerations	1/ 01
		•	14–21
	Α.	Initial Clearance Test Failure Rates	14–21 14–21
	А. В.	Initial Clearance Test Failure Rates Key Factors In Effective Cleaning	14–21 14–21 14–21
	А. В. С.	Initial Clearance Test Failure Rates Key Factors In Effective Cleaning Special Problems	14–21 14–21 14–21 14–21
VI	A. B. C. I. A	Initial Clearance Test Failure Rates Key Factors In Effective Cleaning Special Problems Iternative Methods	14–21 14–21 14–21 14–21 14–22
VI	A. B. C. I. A A.	Initial Clearance Test Failure Rates Key Factors In Effective Cleaning Special Problems Iternative Methods Vacuums	14–21 14–21 14–21 14–21 14–22 14–22

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Step-by-Step Summary



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



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

I. Introduction

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

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

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

A. Performance Standard

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

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning

procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

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

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

1. Low Clearance Standards

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

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

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

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



2. Worker Inexperience

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

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

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

4. Deadlines

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

II. Coordination of Cleaning Activities

A. Checklist

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

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?

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

B. Equipment Needed for Cleaning

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



C. Waste Disposal

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

III. Cleaning Methods and Procedures

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

A. Containment

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

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

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

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

Although HEPA filtered vacuums and 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 finedust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.



Operating Instructions

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

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

Special Attachments

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

Selecting Appropriate Size(s)

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

Wet-Dry HEPA Vacuums

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

Prefilters

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

HEPA Vacuuming Procedures

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

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

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

Emptying the HEPA Vacuum

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



Parts of a HEPA-vacuum

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

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

2. Wet Detergent Wash

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

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



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



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

Manufacturer's Dilution Instructions

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

Appropriate Cleaning Equipment

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

Proper Wet-Cleaning Procedures

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

Changing Cleaning Mixture

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


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

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

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

✤ First, the area is HEPA vacuumed.



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Chapter 14: Cleaning

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

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

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

Single-Pass Wet Wash/HEPA Vacuum

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



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14–13 FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2435 of 5269

Figure 14.4c (continued)

Wash all surfaces with suitable detergents

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



Wipe All Surfaces



Wet Mop Floor



Don't Dry Sweep

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Figure 14.4d (continued)

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

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



4. Sealing Floors

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

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

IV. Order of Cleaning Procedures During Lead Hazard Control

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

A. Precleaning Procedures

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



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

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



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



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

B. Ongoing Cleaning During the Job

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

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will



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

return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

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

1. Large Debris

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

2. Small Debris

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

3. Exterior Cleaning

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

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6mil 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 plasticremoval process usually requires workers to use protective clothing and respirators.

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

1. Decontamination of Workers, Supplies, and Equipment

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

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

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



Figure 14.8a Pick Up Corners of Plastic Sheeting.



Figure 14.8b Fold Plastic Inward.

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

B. Preliminary Visual Examination

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

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

C. Surface Painting or Sealing of Nonfloor Surfaces

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

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

D. Final Inspection

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

E. Recleaning After Clearance Failure

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

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

VI. Cleaning Cost Considerations

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

A. Initial Clearance Test Failure Rates

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

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



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

B. Key Factors In Effective Cleaning

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

C. Special Problems

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

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



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

VII. Alternative Methods

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

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

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

A. Vacuums

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

B. Trisodium Phosphate and Other Detergents

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

Table	14 1	Initial	Cleaning	Wine-Test	Failure	Rates for	Various	Abatement	Strategies
labic	17.1	million	cicaring	vvipc-icst	i anui c	Rates IOI	various	Abatement	Juaccyles

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.

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

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

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

14-23

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

APPENDIX G

MOLD GUIDANCE

Army Facilities Management Information Document on Mold Remediation Issues

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

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

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

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

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

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

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

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

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

REMEDIATION PLANNING

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

REMEDIATE MOISTURE AND MOLD PROBLEMS

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

REMEDIATION PROCEDURES

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

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

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

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

FOUR REMEDIATION LEVELS

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

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

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

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

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

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

Contaminated materials that cannot be cleaned should be sealed and doublebagged 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.

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

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

Contaminated materials that cannot be cleaned should be sealed and doublebagged 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.

TG 277

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 doublebagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

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

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

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

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft²) follow Level I guidance for PPE and containment and for a areas (>10 ft²) follow Medium (Level II) or when greater than 100 ft² follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

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

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

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

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

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

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

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

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

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

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

The following procedures are recommended:

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

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

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

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

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

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

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

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

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

HAZARD COMMUNICATION

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

CONCLUSION

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

REFERENCES

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- American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.
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- 4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.
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- 7. Occupational Safety & Health Administration. *Respiratory Protection Standard*, 29 *Code of Federal Regulations 1910.134*. 63 FR 1152. January 8, 1998.
- 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.			

Ξ

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 				

Ξ

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

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

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

Disposable Protective Clothing

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

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

APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

Containment Tips

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

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

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

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

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278 February 2002



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2469 of 5269

Table of Contents

Introduction
Safety Tips While Investigating And Evaluating Mold And Moisture Problems
Communicate With Building Occupants At All Stages Of Process, As Appropriate 3
Routine Investigation And Evaluation Of Moisture And Mold Problems
Assessments Requiring Sampling 3
References 4
APPENDIX A: Mold Investigation Decision Logic
APPENDIX B: Mold Remediation Guidelines
APPENDIX C: Personal Protective Equipment11
APPENDIX D: Containment Guidance13

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

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

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

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

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination².

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

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

Communicate with building occupants at all stages of process, as appropriate¹.

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

Routine Investigation and Evaluation of moisture and mold problems³.

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

Assessments Requiring Sampling

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

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

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination².

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air⁴. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control⁴."

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

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

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MOLD INVESTIGATION DECISION LOGIC



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MOLD INVESTIGATION DECISION LOGIC NOTES:

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

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

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

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

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

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities³. Confirm negative pressure with smoke tubes.

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

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

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

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

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

APPENDIX B

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

Mold Remediation Guidelines

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

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

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

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

TG 278

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

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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.

Feb 02

APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

Containment Tips

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

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

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

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

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene Study

National Guard Facility Edgewood Readiness Center Building E4305, APG Edgewood, Maryland 21010-5401

Prepared for:

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

Prepared by:

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

Report Date: December 30, 2008

Project ID: IHMO080101.03



Senior Industrial Hygienist



Manager, Charlotte Operations

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TABLE OF CONTENTS

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

List of Appendices

Appendix A:	Photographs
Appendix B:	Laboratory Analysis Report

2

EXECUTIVE SUMMARY

An industrial hygiene survey was conducted August 21, 2008 at the Readiness Center Facility Identification No.494 located in Edgewood, Maryland. The study was performed by Mr. Non-Responsive.

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 samples collected were found to have detectable levels of lead contaminant.

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).

Operation Description

The Edgewood Readiness Center primarily serves as an office setting and equipment storage facility. The facility consists of a single story 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 flat rubber membrane roof system covered with stone. The heating, ventilating, and air conditioning system (HVAC) consisted of a split direct-expansion (DX) system and a radiator heating system. The floors were composed of a poured concrete slab and in some areas were finished with 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 70 administrative personnel. The employees on site were conducting general administrative work.

Noise Survey

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

Lead Testing

At the time of the assessment, no activities were observed which may lead to lead exposure other than ammunition handling. The facility contains an unoccupied room which was once an indoor firing range.

Various surfaces within the facility were screened for lead using surface/wipe samples and the collection of air samples. Surface/wipe samples were collected using Ghost WipeTM samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 μ m 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.

No deteriorated paint was observed. No lead was detected in any sample collected.

4

Lead Testing Results Summary									
Location	Air ug/m ³	Surface ug/ft ²	Bulk	Chip %Pb					
01-A: Former Range/Gym	<3.3								
02-A: 104D: Office	<3.3								
01-W: Former Range/Gym Floor	<3								
02-W: Kitchen Shelf		<110							
03-W: Office 104D Cabinet Top		<110							
04-W: Office 206C Office Cabinet Top		<110							
05-W: Office 204A Mail File		<110							
06-W: Main Lobby: Shelf Top		<110							
Criteria	50	200	5,000	0.5					

Key: ND – None Detected PB – Lead

<u>Lighting</u>

A lighting assessment was conducted throughout the facility. The survey was conducted with large bay doors closed. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. 98047EL). The light meter was last calibrated on February 22, 2008. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary									
Location	Foot Candles	Recommended Lighting	Sufficient Lighting						
Gym	39	30	Yes						
Kitchen	63	50	Yes						
Supply – 113A	51	30	Yes						
Locker area	8	7	Yes						
Room 109A	38	30-50	Yes						
Room 106A	41	30-50	Yes						
Room 104A	76	30-50	Yes						
Room 130A	50	30-50	Yes						
Room 206C	66	30-50	Yes						
Room 201F	54	30-50	Yes						
Room 201L	76	30-50	Yes						
Room 205F	56	30-50	Yes						
Room 204A	38	30-50	Yes						
Room 203C	58	30-50	Yes						
Room 201M	53	30-50	Yes						

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 68.0° F to 79.7° F with relative humidity readings ranging from 50.0% to 67.8%. During the survey, CO₂ levels ranged from 410 ppm to 632 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO₂ recommended is 1,089 ppm (389 ppm + 700 ppm). The results of the testing met the ASHRAE guidelines.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	83.4	47.7	400	0
Outdoors	86.0	41.1	389	0
Gym	79.7	50.0	632	0
Kitchen	77.9	52.3	500	0
Supply Room 113A	75.2	58.1	483	0
Locker Room	73.4	56.8	447	0
Office 109A	72.5	56.2	442	0
Office 104D	73.4	55.2	410	0
Office 130A	78.8	52.9	554	0
Office 206C	75.2	56.4	456	0
Office 201F	73.4	59.0	458	0
Office 201L	72.5	60.6	494	0
Office 205F	71.6	62.3	480	0
Office 204A	68.0	67.8	467	0
Office 203C	69.8	65.4	504	0
Office 201M	69.8	64.1	503	0
Criteria	73.0-79.0	30-50	<1,084	<9.0

IAQ Assessment Summary

Air quality samples were collected from Rooms 113A, 104D, and 206C as well as outdoors (as control). Indoor fungal spore levels ranged from 328 to 6,130 spores/m³. The concentration observed outdoors was found to range from 7,020 to 8,250 spores/m³. Fungal spore concentrations from inside the building were compared to those levels identified outdoors. Indoor air quality, in relation to airborne fungal spores, was found to be acceptable with the exception of room 113A which was found to have elevated levels of *Aspergillus/Penicillium*. Outdoor *Aspergillus/Penicillium* counts ranged from 492 to 903 spores/m³ while Room 113A was found to have an *Aspergillus/Penicillium* concentration of 1,640 spores/m³.

Water damaged ceiling tiles were identified in several areas and appeared to have been impacted by roofing leaks. Reportedly, a new roof was added to the facility in 2007.

Elevated humidity levels were identified throughout the second floor. It appears to be due to operational parameters of the HVAC equipment.

Suspect Asbestos Containing Building Materials

• Suspect asbestos containing materials include sheetrock/joint compound, floor tiles and associated mastic, and vinyl covebase. Thermal system insulation was found to be a combination of paper wrapped fiberglass with PVC elbows.

Ventilation System Assessment

The heating, ventilating, and air conditioning system (HVAC) consisted of a split directexpansion (DX) system and a radiator heating system. The intake filters and coils appeared to be in good condition with little dust loading. Interior fiberglass appeared to have visible dust accumulation. No record keeping could be identified concerning the frequency of maintenance activities such as cleaning or filter changes. Supply ducts were found to contain dust loading.

Additional Items

No O&M plan could be identified. Initiate an O&M Plan for the asbestos containing materials or presumed asbestos containing materials. Maintain a copy of the O&M Plan onsite at all times.

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

7

scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

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

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

Appendix A

Photographs



Dust loading on HVAC supply duct



Water damaged ceiling panel – Room 104





Water damaged ceiling – room 113A



Exterior view of facility



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Appendix B

Laboratory Analysis Report





AMA Analytical Services, Inc.



				Invoice:	95246
Cilent:	National Guard Bureau	Job Name:	RC #494 Edgewood, Maryland	Chain Of Custody:	181402
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI	Job Location:	Not Provided	Date Submitted:	10/1/2008
	State Military Reservation	Job Number:	Not Provided	Date Analyzed:	10/8/2008
	Havre de Grace, Maryland	P.O. Number:	Not Provided	Date Invoiced:	10/8/2008
	21078			Person Submitting:	Non-Responsive

Attention:

Page 1 of 1

AMA Sample #	Client Sample #	Client Analysis and Sample # Sample Type		Cost	Additional Analysis and Sample Type *	Turn Around *	Additional Cost *	Total Cost
0882217	NGA-01-A	AA Lead Air	5 Day +	\$8.00				\$8.00
0882218 0882219	NGA-02-A NGA-03-A	AA Lead Air AA Lead Air	5 Day + 5 Day +	\$8.00 \$8.00				\$8.00 \$8.00
0882220 0882221	NGA-01-W NGA-02-W	AA Lead Wipe AA Lead Wipe	5 Day + 5 Day +	\$8.00 \$8.00				\$8.00 \$8.00
0882222	NGA-03-W	AA Lead Wipe	5 Day +	\$8.00				\$8.00 \$8.00
0882223	NGA-05-W	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882225 0882226	NGA-06-W NGA-07-W	AA Lead Wipe AA Lead Wipe	5 Day + 5 Day +	\$8.00 \$8.00				\$8.00 \$8.00
0882227 0882228	OR OF	MLD Spore Trap MLD Spore Trap	5 Day + 5 Day +	\$30.00 \$30.00				\$30.00 \$30.00
0882229 0882230	113A 104D	MLD Spore Trap MLD Spore Trap	5 Day + 5 Day +	\$30.00 \$30.00				\$30.00 \$30.00
0882231	206C	MLD Spore Trap	5 Day +	\$30.00				\$30.00

Sub-Total:	\$230.00
Additional Charge:	\$0.00
Total:	\$230.00
	· · · · · · · · · · · · · · · · · · ·

Note: Payment Due Upon Receipt.

May, 2018

Note: All Accounts over 30 days are subject to a 11/2% per month service charge.

* Only apply if additional analysis was performed on the sample(s)

NATLG Account Code:

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Remit to: P.O. Box 646, Hanover, Maryland 21076, 410-684-3327
Posted to NGB FOIA Reading Room
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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2499 of 5269 4475 Forbes Blvd. - Lanham, MD, 20706 - (301) 459-2640 - Toll Free (800) 346-0961 - Fax (301) 459-2043

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

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 neutral preterion to clicuts, the public, and these Laboratories, this report submitted and accepted for the credusive use of the client to whom it is addressed and upon the condition to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample the presone with the appropriate regulatory guidelines, nuless otherwise requested by the client in whole grant is individed in accordance with the appropriate regulatory guidelines, nuless otherwise requested by the client. NVLAP accreditation applies only to polarized light microscopy of built samples. This report must not be used to chain, and does not imply product certification, approval, or endorsement by NVLAP. NIST, or any agency of the Federal Covernment. All rights reserved. AMA Analytical Services, Inc.

	088222:	0882224	088222	0882222	088222	0882220	088221	0882218	0882217	AMA Sam Numbei		Attenti			Address	Client:		
NGA-07-W	NGA-06-W	I NGA-05-W	NGA-04-W	NGA-03-W	NGA-02-W) NGA-01-W	NGA-03-A	NGA-02-A	NGA-01-A	ple Client Sample Number		Non-Re		Havre de Grace, Ma	an 301-IH Old Bay Lan State Military Reser	National Guard Bure	Specialized Environm	
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****	***	****	****	**	***	***	0	916	920	Air Volume (L)	of Atomic /		Not Provided	Not Provided	Not Provided	RC #494 Edg	ERTIFIC/	
N/A	0.108	0.108	0.108	0,108	0.108	0.108	N/A	N/A	N/A	Area Wiped (ft ²)	Absorption					ewood, Maryland	NTE OF AN	
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4475 Forbes Blvd. • Lanham, MD, 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (301) 459-2643

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Analysis Method I Analysis Method I N/A = Not Applics %Pb = percent le Note: All samples Note: All results h should not be cor Air and Wipe resu	AMA Sample Number	Attention:			Address:	Client:
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(M)-7420; Water: /200(N)-7421; W rts per million (pp pb) Analy	Air Volume (L)	f Atomic A	Not Provided	Not Provided	Not Provided	RC #494 Edge
SM-3111B rater: SM-3113B m) st: Mellssa Sampsq	Area Wiped (ft ²)	bsorption A				wood, Maryland
See QC Summary for analyt associated with these samp NY ELAP accrediation applies samples.	Reporting	vnalysis for Lead	Date Analyzed:	Person Submitting	Date Submitted:	Chain Of Custody:
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lity control samples ip, wipe, and water DCCATREY Edward Carney	Comments	Page 2 o	Report Date: 9/9/2008			100470

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May, 2018

Environmental Lead ġ

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ACCARDITE LA

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS



AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 16548

Analysis	Турс:	Flame		
Sample Type: Analysis Date		Wipe		
		9/9/1008		
Re	sult	Percent Recovery	RPD	Comment
0 021	ppm			Acceptable
0 3886	ppm	16 6°è		Acceptable
#Num!	m&Kg			
#Num!	mg/Kg		Alterios.	#L ^a nor
		99.37%		Acceptable
				Acceptable
293 671	μB	103.05%		Acceptable
288.608	Hß	103 42%	0.36%\$	Acceptable
	Analysis Sample 1 Analysis Re 0 021 0 3886 #Num! #Num! 293 671 288.608	Analysis Type: Sample Type: Analysis Date Result 0 021 ppm 0 3886 ppm #Num! mg/Kg #Num! mg/Kg #Num! mg/Kg #Num! mg/Kg	Analysis Type: Flame Sample Type: Wipe Analysis Date 9/9/2008 Result Percent Recovery 0 021 ppm 0 3886 ppm 0 3886 ppm %Num! mg/Kg %Num! mg/Kg 99.37% 293.671 288.608 µg	Analysis Type: Flame Sample Type: Wipe Analysis Date 9/9/2008 Result Percent RPD 0 021 ppm 0 3886 ppm 0 3886 ppm %Num! mg/Kg %Num! mg/Kg 99,37% 293 671 µg 103.05% 103.42% 288.608 µg

Calibration Information

Correlation of Calibration Curve:

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this	Sample D	Delivery (Gruup (SDG)	
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Chain Of Custod	y - AMA Sample Number	Client Sample Number
503164	817K3	OUN-UW-01
503164	\$1784	OLN-1 W-02
SDG Number:	16548	

0.99987

Page 1 of 2

Chain Of Custody	AMA Sample Number	Client Sample Number
503164	B1785	OLN-LW-03
\$03164	81786	OLN-LW-04
503164	817R7	OLN-LW-05
503164	81788	OLN-1W-06
503164	81784	OLN-LW-07
503164	81790	OUN-UW-08
503164	81791	OLN-1.W-09
503164	81792	OLN-1.W-10
503164	K1793	OUN-LW-FB1
81 -1 02	82220	NGA-01-W
181402	82221	NGA-02-W
181402	82222	NGA-03-W
181402	82223	NGA-04-W
181402	82224	NGA-05-W
181402	82225	NGA-06-W
(81402	82226	NGA-07-W

Samples included in this Sample Delivery Group (SDG)

SDG Number: 16548

Page 2 of 2



AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 16547

	Analysis	Type:	Figme		
	Sample Type: Analysis Date:		Air 9-8/2008		
	Re	sult	Percent Recovery	RPI)	Comment
Preparetion Black	-0.103	ppm			Acceptable
Report Limit Verification Sample	0 2194	ppm	<u>87 9%</u>		Acceptable
Expected Spike Level (gpm) 0.25					
Duplicate Sample 1	#Num!	mg/Kg			
Duplicate Sample 2	≓Num!	mg/Kg		≓Error	#Error
Matrix Spike Analysis					
Spiked Sample			106.15%		Acceptable
Spike Duplicate			104.70%	1 38%	Acceptable
Laboratory Control Sample 1	110.689	μg	105 18%		Acceptable
Laboratory Control Sample 2	113 155	μg	103 75%	1 36%	Acceptable

Calibration Information

Correlation of Calibration Curve

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)					
Chain Of Custody	AMA Sample Number	Client Sample Number			

180767		\$2077	N0276-01
\$0767		82078	N0276-02
SDG Number:	16547		

0.00001

Page 1 of 2
Chain Of Custody	AMA Sample Nomber	Client Sample Number
180767	82079	N0276-03
181402	82217	NGA-01-A
181402	82218	NGA-02-A
181402	82219	NGA-03-A
181404	#2232	487-1
181404	R2233	487-2
181404	82234	487-3
181417	82245	492-2
181417	822.46	492-1
181417	82247	492-3
503172	82261	94081.BP-1
503172	82262	94081 BP-2
503173	82263	92081.61-1
503173	82264	92081.0P-2
503174	82265	9,5081.BP-1
503174	82266	95081.BP-2
503175	82267	9308LBP-1
503175	82268	93081.BP-2

SDG Number: 16547

Page 2 of 2

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS Spore Trap Analysis Report



Client:	National Guard	Bureau			Job I	Name:	RC #494 Edgewood, Maryla	nd C	hain Of Ca	ustody:	18140	2
Address:	301-IH Old Bay State Military R	/ Lane, Att leservation	n: NGB-/	AVN-SI,	Job I	Location:	Not Provided	D	ate Submi	ited:	9/4/20	08
	Havre de Grace,	, Maryland	1 21078		Job I	Number:	Not Provided	Р	erson Subi	nitting	NON-Re	espon
Attention:	Non-Responsive				P.O .	Number:	Not Provided	D	ate Analyz	æd:	9/9/20	08
								R	eport Date	:	9/9/20	008
	1		088222	7			AMA Sample #		. 0882228	8		
ANIA Sample #			000222	D			Client ID		0	7		
			0	r.			A nalvet ID		RC	•		
Analyst ID			Kin O. Ca				Collection Apparatus		Air-O-Cel	1		
Collection App	aratus			50 50			Concention Apparatus		15	•)		
Sample Volume	e(L)		13				A nelytical Sangitivity (cn/m ³)		41	,		
Analytical Sens	sitivity (sp/m³)		4	1			Analytical Sensitivity (spine)		Accentabl	A		
Sample Condit	10 n		Ассертав	ie			Sample Condition		Acception	•		
		Raw CT.	%	sp/m	13			Raw CT.	%	sp	o/m³	
Alternaria		Present		<	41		Alternaria	2	1.0%		82	
Ascospores		14	8.2%		574		Ascospores	18	9.0%		738	
Aureobasidium	1						Aureobasidium					
Basidiospores		105	61.4%	4	4,310		Basidiospores	103	51.2%		4,230	
Bipolaris/Drec	hslera/Helm.						Bipolaris/Drechslera/Helm.				ļ	
Boletus							Boletus					
Botrytis		· ·	ŗ				Botrytis					
Cercospora			L				Cercospora					
Chaetomium		Present	,	<	41		Chaetomium					
Cladosporium		13	7.6%		533		Cladosporium	25	12.4%		1,030	
Coprinus			:		:		Coprinus					
Curvularia		l i			İ		Curvularia					
Enicoccum							Epicoccum	1	0.5%		41	
Fusarium					÷		Fasarium					
Ganoderma		· .	!				Ganoderma					
Nigrospors		Į					Nigrospora		E			
Penicillium / A	spergillus	12	7.0%		492		Penicillium / Aspergillus	22	10.9%		903	
Pithomyces	-F8	Present		<	41		Pithomyces	1	0.5%		41	
Rusts							Rusts					
Smuts/Periconi	a/Mvxomvcetes	2	1.2%		82		Smuts/Periconia/Myxomycetes	Present		<	41	
Stachybotrys		1	:				Stachybotrys	i				
Stemphylium			:		1		Stemphylium	1				
Trichoderma							Trichoderma		:			
Torula		:			1		Torula	Present	1	<	41	
Clocladium							Glocladium					
Zygomycetes							Zygomycetes					
Other Colories	s	24	14.0%		985		Other Colorless	29	14,4%		1,190	
Unknown	-						Unknown	Present		<	41	
Hyphal Fragm	ents*	Present	i	<	41		Hyphal Fragments*	2	i		82	
Zygophiala		1	0.6%		41							
		: 1	ļ						:		:	
Totals Spore C	oncentration				7,020		Totals Spore Concentration				8,250	
Location							Location					
Comments							Comments					

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Spore Trap Analysis Report

Client:	National Guard	Bureau		J	ob Name:	RC #494 Edgewood, Maryla:	nd C	hain Of Ci	ustoay:	181402	2
Address:	301-IH Old Bay State Military R	v Lane, Att leservation	tn: NG B- A' 1	VN-SI, Jo	ob Location:	Not Provided	D	ate Submi	tted:	9/4/20	08 osnonsive
	Havre de Grace	, Maryland	d 21078	J	ob Number:	Not Provided	P	erson Subi	mitting:	NOT-1	sponsive
Attention:	Non-Responsive			P	.O. Number:	Not Provided	D	ate Analyz	zed:	9/9/20	08
							R	eport Date	e;	9/9/20	08
AMA Sample #	ŧ		0882229	•		AMA Sample #		088223	0		
Client ID			113A	L		Client ID		1041	D		
Analyst ID			RC	I.		Analyst ID		RO	2		
Collection Apr	aratus		Air-O-Cell			Collection Apparatus		Air-O-Ce	11		
Sample Volum	e (L)		150)		Sample Volume (L)		15	0		
Analytical Sen	sitivity (sp/m ³)		27			Analytical Sensitivity (sp/m ³)		27	7		
Sample Condit	tion		Acceptable	;		Sample Condition		Acceptabl	le		
		Daw CT	9/2	sn/m ³			Raw CT.	%	sp/n	n³	
Altornaria		1	0.4%	2	7	Alternaria	Present		< .	27	
Aneruaria		23	10.3%	62	9	Ascospores	10	10.1%		274	
Aureobaciding			10.270			Aureobasidium					
Residiospores		90	40.2%	2,46	0	Basidiospores	44	44.4%		1,200	
Binolaris/Drec	hslera/Heim.		, ,i			Bipolaris/Drechslera/Helm.		· .			
Boletus						Boletus					
Botrytis		!			I	Botrytis					
Cercospora		i.				Cercospora				:	
Chaetomium						Chaetomium				İ	
Cladosporium		31	13.8%	84	8	Ciadosporíum	6	6.1%		164	
Coprinus						Coprinus					
Curvularia		1	0.4%	2	7	Curvularia	Present		<	27	
Epicoccum		Present		< 2	7	Epicoccum	3	3.0%,		82	
Fusarium						Fusarium					
Ganoderma						Ganoderma		i İ		i	
Nigrospora		Present		< 2	.7	Nigrospora		22.28		602	
Penicillium / A	spergillus	60	26.8%	1,64	0.	Penicillium / Aspergillus	22 i	22.2%		602	
Pithomyces		Present		< 2	.7	Pithomyces	!	1			
Rusts			ايمبيا		_	Rusts		1.0%		27	
Smuts/Pericon	ia/Myxomycetes	1	0.4%	2	.7 [Smuts/Periconia/Myxomycetes	1	1.070		£/	
Stachybotrys						Starnybotrys	1	i i			
Stemphylium						Trichoderma	:			1	
Trichoderma		!				Tornia	:				
Torula			1			Diocladium					
Liocladium		1	1			Zvgomycetes	1			-	
Zygomycetes		:	7 6%	46	5	Other Colorless	13	13.1%		356	
Unter Colorie	55	i /	1.070	< 2	7	Unknown	:	1		:	
Unknown Hynha) Ecogn		1			17	Hyphal Fragments*	Present		~	27	
нурнагтади	içuts	i		-				: i			
		1	:								
Totals Spore (Concentration			6,13	0.	Totals Spore Concentration				2,710	
Location						Location					
()						Comments					
Comments						- Children and					

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Page 3 of 4

Spore Trap Analysis Report

Client:	National Guard Bureau	Job Name:	RC #494 Edgewood, Maryland	Chain Of Custody:	181402
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:	Non-Responsive
Attention:	Non-Responsive	P.O. Number:	Not Provided	Date Analyzed:	9/9/2008
				Report Date:	9/9/2008

AMA Sample #		0882231	
Client ID		206C	
Analyst ID		RC	
Collection Apparatus		Air-O-Cell	
Sample Volume (L)		150	
Analytical Sensitivity (sp/m ³)		27	
Sample Condition		Acceptable	
	Raw CT.	%	sp/m³
Alternaria		i	
Ascospores	1	8.3%	27
Aureobasidium			
Basidiospores	2	16.7%	55
Bipolaris/Drechslera/Helm.			
Boletus			
Botrytis			
Cercospora			
Chaetomium			
Cladosporium	1	8.3%	27
Coprinus			
Curvularia	-		
Epicoccum			
Fusarium	1		
Ganoderma			
Nigrospora			
Penicillium / Aspergillus	8	66.7%	219
Pithomyccs			
Rusts			
Smuts/Periconia/Myxomycetes	5 ;		
Stachybotrys	1		
Stemphylium			
Trichoderma	1	i i	
Torula			
Ulocladium			
Zygomycetes			
Other Colorless			
Unknown			
Hyphal Fragments*	1		27
Totals Spore Concentration			328
Location			

Comments

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Spore Trap Analysis Report

Client:	National Guard Bureau	Job Name:	RC #494 Edgewood, Maryland	Chain Of Custody:	181402
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:	Non-Responsive
Attention:	Non-Responsive	P.O. Number:	Not Provided	Date Analyzed:	9/9/2008
				Report Date:	9/9/2008

General Comments, Disclaimers, and Footnotes

Analytical Method:	Sample are analyzed following the instructions and guidelines outlined in AMA Analytical Services, Inc. SOP 901.					
Sample Condition:	Acceptable: The sample was collected and delivered to the our location without disturbing the material on the sampling nedia.					
	Unacceptable: 1. The sample is overloaded with material. 2. The sample trace has been disturbed. 3. The sample was not collected properly.					
	Obscured: The loading on the sample is high, possibly obscuring spores present. The quantity reported should be considered the minimum concentration present. The actual concentration may be higher than the reported concentration.					
Spore Notes:	Based on their small size and very few distinguishing characteristics, Aspergillus and Penicillium cannot be differentiated by non-viable sampling methods. There are other types of spores whose morphology is similar to Aspergillus and Penicillium and cannot be differentiated by non-viable sampling methods. Examples of these similar spores are Acremonium, Paecilomyces, Wallemia, and Trichoderma.					
	Smut, Periconia and Myxomycetes are three different types of organisms that have similar morphological characteristics.					
	Bipolaris/Dreschlera/Helm: Bipolaris / Dreschlera / Helminthosporium group.					
	Other Colorless represents all colorless spores that are non-distinctive and unidentifiable.					
*	Hyphal Fragments: A portion of the mycelium that becomes separated from the remainder of the thallus (vegetative body), each of which has the capacity to grow and form new individuals. Results for hyphal fragments are in fragments/m ³ and are not incorporated in the total spore concentration.					
Quantification:	Analytical Sensitivity (A.S.): This is dependent on the volume of air collected and the amount of the trace that was analyzed.					
	The value of "Present" indicated in the Raw Count column represents the presence of this spore type during the preliminary exam at 400x. The Raw Count converts to a whole number if the spore type is encountered again during the 1,000x enumeration. The sp/m ³ concentration will be reported as less than the analytical sensitivity i "Present" is reported in the Raw Count.					
	Due to rounding, totals may not equal 100%					
	sp/m ³ : Spores per cubic meter.					

Results are reported to 3 significant figures.

Kolender Mungate

Rolenda Chuyate Analyst

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.

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Posted to NGB FOLD READING BARRAM, MD, 20706 BEST ASSI ASSI ASSI AND FOR (800) 39610984 QUESTE (BROKASD#2643.0085 (MD) May, 2018 Released by National Guard Bureau Tuesday, September 09, 2008 Page 2509 of 5269

Page 4 of 4



STAFF ONLY: 2. Date/ time Analyzee: 1/1/2/2009 By (Print): 1/1/2014 (CUSTODY) 3. Results Reported To: 1/1/2010/04/2510 Viz: 2/1/2/2 Date:	LABORATORY L DATE/Time RCVD: 6 / 4 / C C Win L PS By must by			Sec Attached		CLEWT ID SAMPLE INFORMATION VOLUME WIPE $ z z z z z z z z z z$	D EPA 600 - Visual Estimate (QTY) (QTY) D EPA 70int Count (QTY) (QTY) D SPA Point Count (QTY) (QTY) D NY State Friable 198.1 (QTY) (QTY) D Grav. Roduction ELAP 198.6 (QTY) (QTY) D Other (specify (QTY)) (QTY)	D NIOSH 7400 (QTY) D Residual Ast (QTY) D Fiberglass (QTY) TEM Dust D Fiberglass (QTY) TEM Dust D Residual Ast (QTY) D Qual. (previates) Vacuum/Dust (QTY) D AHERA (QTY) D Quat. (s/area) Vacuum D5755-95 (QTY) D NIOSH 7402 (QTY) D Quat. (s/area) Ust D6480-99 (QTY) D Other (specify) (QTY) TEM Water D Must. TEM Water	Asbestos Analysis <u>PCM Air</u> – Please Indicate Filter Type: <u>PC MCE Porosity</u> ita 25mm 37mm <u>IEM Buik</u> <u>IEM Buik</u> <u>IEM Buik</u> <u>IEM Buik</u> <u>IEM Buik</u> <u>IEM Buik</u> <u>IEM Buik</u> <u>IEM ANDiatfield</u> <u>IEM OTY</u>	Reporting Information (Results will be provided as soon as technically AFTER HOURS (must be pre-scheduled) NORMAL BUSINESS HOURS D'Immediate Date Due: D'At Hours Time Due: D'At Hours Time Due: D'At Hours Time Due: D'At Hours Time Due: D'At Hours Time Due: D'At Hours Time Due: D'At Hours Time Due: D'At Hours Time Due: D'At Hours D'Ate Due: D'At Hours D'Ate Due: D'At Hours D'Ate Due: D'At Hours D'Ate Due: D'At Hours D'Ate Due: D'At Hours D'Ate Due: D'Ate Due: Made the Accomodate)	2. Address 1: $30' - 1H' Ott Key Leve 2 Job Location: 3. Address 2: Harve de Grère (MD 24078 3. Job #. 4. Address 3: Job #. 5. Phone #: 33_4' 4s 2558 Fax # Joy S93 1650 5. Submitted by:$	Mailing/Billing Information: 1. Client Name: Mattern Grove Burger NE I. Job Name: RC # 494 E	AMA Analytical Services, Inc. Focused on Results ATHA (#100470) NVLAP (#101143-0) NY ELAP (10220) 4475 Forbes Blvd. • Lanham, MD 20706 (301) 459-2643 CHAIN OF CUSTODY
1440 Sign Custon Classing Ma 1 / 1 / 12 Time: Initialis:	any 28 cm - some Alt Ar		Date/Ind: Contact By:	Date: T.ne: Contact Rv:	Date''[] the Conthet By	$\frac{2}{2} \left(\frac{2}{2} \right) = \frac{2}{12} \left(\frac{2}{2} \right) = \frac{1}{12} \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) = \frac{1}{12} \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) = \frac{1}{12} \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac{2}{2} \right) \left(\frac$	Mald - 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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2511 of 5269

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Industrial Hygiene Survey

National Guard Facility Edgewood Armory Building E4305 Aberdeen Proving Grounds, MD 21010

Prepared For:

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

Survey Location:

Edgewood Armory Building E4305 Aberdeen Proving Grounds, MD

Prepared By:

Analytical Laboratory Services, Inc. 3544 North Progress Avenue Suite 100 Harrisburg, PA 17110

Survey Date:

July 30, 2010

Report Date: August 13, 2010

ALSI Project #: 1007487

Non-Responsive

Director, Environmental Health & Safety

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

Section 1.0 Executive Summary

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Section 1.0 Executive Summary

On July 30, 2010, Analytical Laboratory Services, Inc. (ALSI) personnel Non-Responsive conducted an industrial hygiene survey at the Edgewood Armory located at Building E4305, Aberdeen Proving Grounds, MD 21010. This facility is also known as the Major General Warren D. Hodges Armory.

- 1. Surface levels of lead exceeded 200 ug/ft² in the attached garage on the floor by the TIG welder. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft².
- Lighting levels met the minimum recommended guidelines in all but the following areas: 1) Room 110, 2) Room 115B, 3) Fitness Room 131A, 4) Room 141A, 5) Room 142A, 6) Room 201A. Lighting should be improved in these areas.
- 3. Indoor air quality parameters of temperature, relative humidity carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment. Relative humidity exceeded the recommended ceiling of 60% and temperature exceeded the recommended criteria of 79 degrees F in one indoor location. There is a 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).
- 4. Overhead vehicle exhaust and battery room exhaust ventilation should be repaired or modified to provide the minimum recommended ventilation rate.

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Section 2.0 Operation Description & Observations

Section 2.0 Operation Description & Observations

The Edgewood Armory consists of offices, a drill hall, garage, and storage areas. There are approximately 50 full-time employees stationed at the facility. On drill weekends there can be many more occupants.

The building was initially constructed in 1970's. The exterior of the building is brick. The interior walls are primarily concrete block, and drywall. The heating, ventilating, and air conditioning system (HVAC) consists of five air handlers. Three are new and two are currently being refurbished. The floors were composed of a poured concrete slab. Some office areas are carpeted. The coilings were generally composed of a 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 as a weight and exercise room.

Site personnel at the time of the site assessment consisted of administrative and maintenance personnel. On site duties were normal or typical.

Overall housekeeping was good. Areas were clean and well kept. Paint was in good condition throughout the facility

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared properly designed. Personnel had supportive chairs. Some lap top computers were in use.

Section 3.0 Noise Survey

Section	3.0 Noise Survey

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

Section 4.0 Lead Testing

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Section 4.0 Lead Testing

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

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected 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.

Sample #	Location	Air ng/m ³	Surface ug/ft ²	Paint Chip %Ph
l	Drill Hall - Room 101A	<4.3		
2	Room 203C	<4,9]
3	Blank	<3 ug		
4	Attached Garage Floor by TIG Welder		370	
5	Attached Garage Office Area Desk		<110	<u>.</u>
6	Drill Hall Heater on Wall		<110	
7	Drill Halt Floor		<110	
8	Drill Hall - Top of Table		<110	· ·
9	Converted Firing Range Room 131A - Floor		<110	
L0	Converted Firing Rauge Room 131A - Front of TV		<110	
	Floor Outside Converted Firing Range Room 131A		<110	
12	Room 141A - Top of TV	•	< 10	
13	Room 104D Top of Microwave		<110	
]4	Main Lobby Floor		<110	
15	Room 105A - Supply Vent		<110	
16	Room 105A - Top of Cabinet		<110	
17	Room 110A Top of Desk		<110	:
18	Room 109A - Top of Desk Shelf		<110	
19	Floor Outside Room 113A		<110	
20	Room 115B ·· Bookshelf		<110	
21	Room 206C – Supply Vent		<110	
22	Room 206E - Top of Desk		<110	
23	Room 201F - Top of Desk Shelf		<110	
24	Room 204A – Window Sill		<110	

Lead Testing Results Summary

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Sample #	Location	Air ug/m ³	Surface ug/ft ²	Paint Chip %Pb
25	Floor Outside Room 203C		<110	
26	Room 201P Baseboard Heater		<110	
27	Blank		<12 ug	
Criteria		50	200	0,5

Key: Bolded results exceed listed criteria

The surface level of lead exceeded 200 ug/ft² in the attached garage on the floor by the TIG welder.

The National Guard Bureau currently utilizes 200 ug/ft² as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for Environmental Chemicals," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft² is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft² on floors and 250 ug/ft² on windowsills should be observed. There is no child care provided at this facility.

Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 ug/m³. In fact, no detectable level of lead was identified in the air samples collected.

Housekeeping and cleaning activities should be improved to maintain surface lead dust concentrations below 200 ug/ft².

Section 5.0 Lighting

Section 5.0 Lighting

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

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Drill Hall Room 101A	14.6	30-50	No
Room 105A	48.9	30-50	Yes
Room 110	15.3	30-50	No
Room 110D	41.3	30-50	Yes
Room 111A	34.7	30-50	Yes
Room 113A	66.2	30-50	Yes
Room 115B	27.2	30-50	No
Fitness Room 131A	21,5	30	No
Room 141A	19.2	30-50	No
Room 142A	13.2	30-50] <u>No</u>
Room 104D	61.3	30-50	Yes
Room 206C	49.3	30-50	Yes
Room 201A	29.3	30-50	No
Room 201F	48.6	30-50	Yes
Room 201L	45.5	30-50	Yes
Room 204A	33.2	30-50	Yes
Room 203C	38.2	30-50	Yes

Light Survey Assessment Summary

Lighting levels met the minimum recommended guidelines in all but the following areas: 1) Room 110, 2) Room 115B, 3) Fitness - Room 131A, 4) Room 141A, 5) Room 142A, 6) Room 201A. Lighting should be improved in these areas.

Section 6.0 Indoor Air Quality

FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2525 of 5269

Section 6.0 Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (earbon dioxide, temperature, and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter. Model 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 68.6 to 82.6 degrees F with relative humidity readings ranging from 43.2% to 61.7%. During the survey, carbon dioxide (CO₂) levels ranged from 437 ppm to 680 ppm within the facility compared to an outdoor CO₂ level of 389 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO₂ recommended is 1,089 ppm (389 ppm \div 700 ppm). The following table summarizes the measurements collected.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	81.8	42.7	376	0.0
Drill Hall Room 101A	82.6	43.2	437	0.1
Room 105A	70.9	50.3	592	0,0
Room 110	69.7	52.8	574	0.0
Room [10]D	68.6	54.4	570	0.0
Room 111A	68.8	56.1	571	0.0
Room 113A	69.3	55.9	623	0,0
Room 115B	68.3	55.6	563	0.0
Fitness Room 131A	73,2	61.7	604	0.0
Room 141A	76,1	52.3	601	0.0
Room 142A	75.4	51.0	597	0.0
Room 104D	73.6	50.3	606	0.1
Room 206C	72.4	51.4	652	0.0
Room 201A	71,9	52.3	680	0.0
Room 2011	72.1	53.3	669	0.0
Room 2011.	70.3	53.3	647	0.0
Room 204A	70.6	55.5	661	0.0

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Room 203C	70.6	54.6	621	0.0
Outdoors	85.9	41.1	401	0.0
Criteria	73.0-79.0	30-60	<1,089	<9.0

Key: Bolded results exceed listed criteria

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 one indoor location. There is a 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 EPA and ASHRAE.

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 by ALSI personnel on site:

- 1. The HVAC system is currently being refurbished. There are a total of five airhandlers. Three air-handlers are new. Two air-handlers are being refurbished.
- 2. No notable water damage or peeling paint was observed. No fungal growth was observed.
- 3. Many areas of the ceiling were missing ceiling tile due to HVAC renovation.

Section 7.0 Suspect Asbestos Containing Building Materials

Section 7.0 Asbestos Containing Building Materials

Only one suspect asbestos containing material (ACM) was identified in the areas inspected. This was spray-on insulation on the metal structural beam in the hallway outside Room 141A. This material appeared to be in good condition. It could also be present in other areas of the building that were not inspected. Hidden or inaccessible areas were not inspected. ACM could be present in hidden areas. No samples were collected.

Section 8.0 Maintenance Bay

Section 8.0 Maintenance Bay

There is a garage area with four maintenance bays at this facility. Vehicle maintenance is performed in this area. There are five full time mechanics. On the day of the survey no noise hazardous operations were performed. Therefore, no noise monitoring was conducted. The area is posted with appropriate signage for noise, chemical, and other safety hazards. Garage areas were clean, well kept, and organized.

A Local Exhaust Ventilation (LEV) system is present to remove vehicle exhaust from the building. The LEV system contains four drops or exhausts. The LEV in each bay consists of a flex duct with an 8" duct diameter. The following flow rates were measured:

- 1. Bay 1 398 CFM
- 2. Bay 2 -- 446 CFM
- 3. Bay 3 442 CFM
- 4. Bay 4 460 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. We recommend the overhead vehicle exhaust system be inspected to determine if it is operating as designed and meets the minimum requirements as recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation: A Manual of Recommended Practice for Design (27th Edition).

There is a battery charging room in place at this facility. There is an exhaust fan in the roof of this area but staff personnel reported that the fan was currently out of operation. This exhaust fan should be repaired to provide the minimum recommended ventilation for battery charging operations.

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Section 9.0 Limitations

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2532 of 5269

Section 9.0 Limitations

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

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

Appendix A Laboratory Analysis Report

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2535 of 5269

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2538 of 5269

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Appendix B Photographs



Photo 1: Exterior view, front.



Photo 2: Exterior view, front.



Photo 3: Attached garage; vehicle maintenance.



Photo 4: Attached garage; vehicle maintenance.



Photo 5: Exhaust ductwork in attached garage.



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Photo 7: Exhaust fan in battery storage area.



Firsto 8: Ethergency eye wash and shower in bactury storage area.



Photo 9: Battery room door.



Photo 10: Dry Blast Machine, in attached garage.



Photo 11: Eye wash station in maintenance bay, in attached garage.



Photo 12: TIG Welder, in attached garage,



Phone 35: MKF Webder, relationship gamps



Photo 14: Drill Hall.



Photo 15: Ceiling, 1" floor hailway; representative of ceiling throughout building.



Photo 16: Boilers.



Photo 17: Converted Ering range.



Photo 18: Hallway outside room 141A, spray-on insulation on metal beam, possible ACM.

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Appendix C Floor Plans

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Appendix D References

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Appendix D. References

- 1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead
- 2. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values and Biological Exposure Indices, 2010 Edition
- American Conference of Governmental Industrial Hygienists (ACGIH), Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition
- 4. American Society of Heating. Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007
- 5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI
- 6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI
- National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.
- Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h)(3)]
- 9. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)
- The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation



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

Industrial Hygiene Survey Report

National Guard Facility Edgewood Readiness Center

Prepared For:	National Guard Bureau Region North IH
	301-IH Old Bay Lane
	Havre de Grace, MD 21078
Survey Location:	Edgewood Readiness Center
	Bldg E4305, APG-EA
	Edgewood, MD 21010
Prepared By:	Compliance Management International, Inc.
	1215 Manor Drive
	Suite 205
	Mechanicsburg, PA 17055
Survey Date:	May 28, 2013

June 26, 2013



Manager, Industrial Hygiene Services

Report Date:

Table of Contents

Section 1.0 Executive Summary
Section 2.0 Operation Description & Observations
Section 3.0 Lead Testing
Section 4.0 Lighting
Section 5.0 Indoor Air Quality
Section 6.0 Suspect Asbestos Containing Building Materials
Section 7.0 Equipment 11
Section 8.0 Limitations
Appendix A. Laboratory Analysis Report
Appendix B. Photographs
Appendix C. Floor Plan
Appendix D. References

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on May 28, 2013, at the Edgewood Readiness Center located at Building E4305, APG-EA Edgewood, MD 21010. The survey was performed by Mr. Non-Responsive, CIH.

- 1. Surface 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. See Section 3.0 for detailed findings.
- 2. Lighting did not meet the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in the 1st floor supply cage areas, fitness center and Classroom 115 Distance Learning Center. Lighting should be improved in these areas. 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 guideline of 68-79 °F.
 - b. Relative humidity levels did not exceed 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 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. A small area of fungal growth was observed in the Men's Restroom next to the Assembly Hall. A few roof leaks are present in the building. See Section 5.0 for detailed findings.
- 5. The building was built in 1989 so no suspect asbestos containing material (ACM) is believed to be present. See Section 6.0 for detailed findings.

Section 2.0 Operation Description & Observations

The Edgewood Readiness Center is mainly an administrative facility with an assembly hall, offices, supply areas, conference rooms and classrooms. There were approximately 60 full-time employees stationed at this facility at the time of this survey.

The building was built in 1989. It is a two-story structure with brick exterior. The interior walls are concrete block and drywall. The floors are concrete, floor tile and carpet.

The Heating, Ventilation, and Air-Conditioning (HVAC) system consists of a forced air, ducted system with roof-top units. This system was on during the survey.

Due to the age of the building there no lead-based paint issues are believed to be present other than those potentially related to the past presence of an indoor firing range. The indoor firing range was previously located on the 1st floor in Rooms 131A and 131B. These rooms are now used for a Fitness Center (131A) and Supply Storage (131B). All of the firing range components have been removed.

There is no child-care facility in the building.

Overall housekeeping practices were good.

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

Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 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.

Sample #	Location	Air ug/m ³	Surface ug/ft ²
1	Fitness Room 131A (old firing range)	<8.1	*
2	Hallway Outside 140A	<8.2	*
3	Blank	<3 ug	*
4	Hallway Outside 131B (old firing range)	*	<110
5	Room 131B Floor	*	<110
6	Room 131B Floor	*	<110
7	Room 131A HVAC Supply Vent Surface	*	<110
8	Room 131A Stored Items	*	<110
9	Kitchen Table	*	<110
10	Assembly Hall Room 101A – Heater	*	<110
11	Assembly Hall Room 101A – Floor	*	<110
12	Room 110B Floor	*	<110
13	Room 203C Conference Room Table	*	<110
14	Room 204A Table	*	<110
15	Room 201P HVAC Supply Vent	*	<110
16	Blank	*	<110 ug
	Criteria	50	200

Lead Testing Results Summary

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

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Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft² on floors and 250 ug/ft² on windowsills should be observed. There is no child care provided at this facility.

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

- Surface levels of lead were below the recommended guideline of 200 ug/ft² at all of the locations sampled.
- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m³).

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.

Leasthan	Foot Candles	Recommended	Sufficient
Location	(FC)	Lighting (FC)	Lighting
138A Supply Cage	15-37	30	No
130A Supply Cage	10-20	30	No
137A Supply Cage	10-51	30	No
128A Supply Cage	8-28	30	No
Hallway Outside Supply		5	Yes
130A/131A	5-40		
Storage/Supply Room 131B	1.7-10.1	30	No
Room 131A Fitness Center	4-31	30	No
Room 134 A HVAC Room	60	30	Yes
Assembly Hall	20-24	10	Yes
Kitchen	106	50	Yes
Dining Room	36	10	Yes
Classroom 115 DLC	27.3	30-50	Yes
Office 112A	50.5	30-50	Yes
Office 110D	58.6	30-50	Yes
Office 201F	40.3	30-50	Yes
Office 201D	71.3	30-50	Yes
Office 201A	48.1	30-50	Yes
Conference Room 211A	60.4	30-50	Yes
Office 212A	76	30-50	Yes
Office 204A	46	30-50	Yes
2 nd Floor Hallway	49.5	5	Yes

Light Survey Assessment Summary

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 1st floor supply cage areas, fitness center and Classroom 115 Distance Learning Center. Lighting should be improved in these areas.

Section 5.0 Indoor Air Quality

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

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

The following table summarizes the measurements collected.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Room 130A Supply Cage	70.4	53.3	448	0
Room 131A Fitness Room	68	59	455	0
Assembly Hall	72.5	63.2* (Overhead Door Open)	503	0
Office 112A	74	47.7	655	0
Office 201F	70.4	55.8	583	0
Outdoors	72.2	67.7	362	0
Criteria	68-79	30-60	<1.062	<9

IAQ Assessment Summary

Table Notes:

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

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

Summary of findings and recommendations:

• Temperature measurements were within recommended guidelines in all areas tested.

- Relative humidity levels were within the recommended guidelines in all areas tested except the Assembly Hall. However, this can be explained due to an overhead door being open while a truck was being loaded. Relative humidity should be maintained at 30-60%.
- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level at the time of the survey. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,062 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 a small area of visible fungal growth in the Men's Restroom about the sink due to a leak. The leak in this area needs to be identified and repaired. The area of fungal growth needs to be properly remediated.
 - All roof leaks need to be identified and repaired.

Section 6.0 Suspect Asbestos Containing Building Materials

The following suspect asbestos containing material (ACM) was noted at the time of this survey:

- 1. The building was built in 1989. No suspect ACM is believed to be present in the building.
- 2. Inaccessible areas such as behind walls or crawlspaces were not inspected.

Section 7.0 Equipment

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

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98011EL	11/2012	NA
SKC Air Sampling Pump	647598	5/28/13	2.5 LPM
SKC Air Sampling Pump	648349	5/28/13	2.5 LPM

Section 8.0 Limitations

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

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

Appendix A. Laboratory Analysis Report

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

LAB #100470 Job Name: Edgewood RC National Guard Bureau Chain Of Custody: 515991 Client: Address: 301-IH Old Bay Lane, Attn: ARNG-CJG-P, Job Location: APG-Edgewood, MD Date Submitted: 5/30/2013 State Military Reservation Havre de Grace, Maryland 21078 Not Provided Job Number: **Person Submitting:** P.O. Number: W912K6-09-A-0003 Date Analyzed: 6/6/2013 **Report Date:** 6/6/2013





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)	Rej	porting Limit	Total ug	Final Res	ult	Comments
13066066	1	Flame	Air	370	N/A	8.1	ug/m³	<3	<8.1	ug/m³	
13066067	2	Flame	Air	368	N/A	8.2	ug/m³	<3	<8.2	ug/m³	
13066068	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13066069	4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13066070	5	Flame	Wipe	****	0.108	110	ug/ft ²	<12	<110	ug/ft²	
13066071	6	Flame	Wipe	***	0.108	110	ug/ft²	<12	<110	ug/ft²	
13066072	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13066073	8	Flame	Wipe	***	0.108	110	ug/ft²	<12	<110	ug/ft²	
13066074	9	Flame	Wipe	***	0.108	110	ug/ft²	<12	<110	ug/ft²	
13066075	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13066076	11	Flame	Wipe	****	0.108	110	ug/fl²	<12	<110	ug/ft²	
13066077	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13066078	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13066079	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13066080	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/fl²	
13066081	16	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	

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

An AIHA (#100470) and NY ELVAP (#10928) Accredited Laboratory

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AIHA LAP, LLC ACCREDITED LABORATORY NDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD **& ENVIRONMENTAL MICROBIOLOGY** ISOIEC 17625-2005 www.aibascoreditediabs.org

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

Job Name: Edgewood RC Chain Of Custody: 515991 Client: National Guard Bureau Address: 301-IH Old Bay Lane, Attn: ARNG-CJG-P, Job Location: APG-Edgewood, MD Date Submitted: 5/30/2013 State Military Reservation Havre de Grace, Maryland 21078 Job Number: Not Provided **Person Submitting:** P.O. Number: W912K6-09-A-0003 6/6/2013 Date Analyzed: Report Date:

Attention:

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

6/6/2013

AIHA LAP, LLC ACCREDITED LABORATORY

NDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD **8 ENVIRONMENTAL MICROBIOLOGY** ISONEC 17025-2005 www.aihancoreditedlabs.org LAB #100470

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Arca Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments
Analysis Method for	or Flame: Air, Wipes,	Paints, and Soil/S	Solids: EPA 600/F	R-93/200(M)-7000	B; Water: SM-311	1B See QC	C Summary for an	alytical results of quali	ly control samples

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B 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/L = parts per billion (ppb) ug = micrograms

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

lesponsi

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.

associated with these

samples.

Analyst: N. McGarvey / S. Chinnapad Technical Manager: G Edward Carney

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

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BEST AVAILABLE COPY 159202 210 REV. 6.08 OWI (410) 247-2024 AMA Analytical Services, Inc. (Please Refer To This 515991 www.amalab.com Focused on Results Number For Inquires) CHAIN OF CUSTODY AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920) page lot 4475 Forbes Blvd. . Lanham, MD 20706 (301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643 Submittal Information: Mailing/Billing Information: Edgewood RI 1. Job Name. 1. Client Name: National Guard Bureau dreyood, MD 2. Job Location 2. Address I: 301-IH Old Bay Lane W912K6-09-A-0003 DO # 3. Job #: 3. Address 2: ____Attn: NGB-ARS-IHNE @ phone # (410) 942-0273 4. Contact Person 4. Address 3: Havre de Grace, Maryland 21078. Fax #: (410) 942-0254 5. Submitted by 5. Phone #: (410) 942-0273 Reporting Information (Results will be provided as soon as technically feasible): REPORT TO: NORMAL BUSINESS HOURS AFTER HOURS (must be pre-scheduled) 3 Day NOW X Inclu ith Report Results Required By Noon □ Immediate Immediate Date Duc:. 13 (EveryAttempt Will Be compliance Mace Con 8) (Em Date Due: Q Next Day Time Due:__ us.army.mi 24 Hours G Fax: (0) 0 Made to Accomodate) 2 Day us.army.mi Comments: Q Verb Metals Analysis Ashestos Analysis TEM Bulk (QTY) D Pb Paint Chip. PCM Air - Please Indicate Filter Type: CIELAP 198.4/Chatfield_ (OTY) (QTY) Pb Dust Wipe (wipe type_ NIOSH 7400____ _(QTY) NY State PLM/TEM____ (QTY) Po Air_ (OTY) (QTY) C Residual Ash_____ (QTY) G Fiberglass (OTY) Pb Soil/Solid : TEM Air - Please Indicate Filter Type: TEM Dust (QTY) D Pb TCLP_ (QTY) AHERA_ (QTY) Oual. (pres/abs) Vacuum/Dust_____ ___(QTY) 🗆 Cu____(QTY) 🗆 As____(QTY) Drinking Water D Pb_ □ NIOSH 7402 _(OTY) Quan. (s/area) Vacuum D5755-95 (OTY) Waste Water D Pb____(QTY) D Cu____(QTY) D As____ (QTY) (QTY) Other (specify_ (QTY) Quan. (s/area)Dust D6480-99_____ D Pb Furnace (Media _____ ____ (QTY) PLM Bulk TEM Water Fungal Analysis EPA 600 - Visual Estimate (QTY) Qual. (pres/abs)_ _(QTY) Collection Apparatus for Spore Traps/Air Samples:_ _(OTY) C EPA Point Count_ (OTY) C ELAP 198.2/EPA 100.2_ ONY State Friable 198.1____ _(QTY) Collection Media. (QTY) C EPA 100.1 (QTY) Surface Vacuum Dust (QTY) Grav. Reduction ELAP 198.6_ (OTY) Spore-Trap____ All samples received in good condition unless otherwise noted. (TEM Water samples _____°C) (QTY) Gurface Swab (QTY) Culturable ID Genus (Media (QTY) Other (specify_ Culturable ID Species (Media (OTY) MISC Q Surface Tape____(QTY) O Vermiculite Other (Specify____)___(QTY) Asbestos Soil PLM_(Qual) PLM_(Quan) PLM/TEM_(Qual) PLM/TEM_(Quan) CLIENT CONTACT SAMPLEINFORMATION VOLUME WIPE 101 SAMPLE LOCATION/ AIR . (LABORATORY STAFF ONLY) CLIENT ID (LITERS) AREA **IDENTIFICATION** DATE NUMBER X Date/Time: Contact: By: Hoven 5/28 Fitness Dorm 370 x -A NL 368 Hellwalton x N D Rich X x Hellusy OutsideF 10000 1 By: K V Date/Time: Contact: 1318 FLOOR X X 1318 Flor × × 131A SE HVAC 5 X X 3 131 A Storwith x Date/Time: Contact: By: ĸ Katchen Table 9 × x 101-A Heckel 10 X 1121-A FLOOD 11 110B Flour 12 @ Via: ----Sign: 100 By (Print): 1. Date/Time RCVD: LABORATORY Sign: 1.__ @_____BESTYAWANLABLE COP / FOIA Requested Record #J-15-0085 (MD) Date: Via: Tim Released by National Guard Bureau (CUSTODY) Page 2572 of 5269

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Appendix B. Photographs

Edgewood Readiness Center Photo Log 5/28/2013



Entrance



Location



Front of Building



Front of Building


Boilers



Fitness Center (Previously Firing Range)

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Assembly Hall



Fungal Growth on Ceiling in Men's Restroom by Assembly Hall

Appendix C. Floor Plan



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Appendix D. References

- 1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead.
- 2. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values and Biological Exposure Indices, 2011 Edition.
- 3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition.
- 4. American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2010.
- 5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.
- 6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.
- 7. National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.
- 8. National Ambient Air Quality Standards (NAAQS) National primary ambient air quality standards for carbon monoxide 40 CFR 50.8.
- 9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h) (3)].
- 10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM).
- 11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.
- 12. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.
- 13. ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.



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

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, LTC James Victor McCool Armory, Elkton, 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. Some of the original color photographs may be hole-punched because the document was originally submitted in a notebook.

4. Our point of contact is Ms. Non-Responsive at commercial (410)436-5474/3118, DSN 584-5475/3118, or by electronic mail: Non-Responsive@us.army.mil

FOR THE COMMANDER:

Non-Responsive Director, Occupational Health Sciences

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Readiness thru Health



FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2583 of 5269

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







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

May, 2018

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

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

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

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

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

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

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

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

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



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

EXECUTIVE SUMMARY MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS LTC JAMES VICTOR MCCOOL ARMORY ELKTON, MD PROJECT NO. 55-ML-01ED-03/05 16 JULY 2003

1. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard (MDARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions. This survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee for the Defense Occupational and Environmental Health Readiness System.

2. CONCLUSIONS.

a. Lead Exposure.

(1) Lead in Paint. Bulk deteriorated paint samples were lead-based paint and leadcontaminated paint. The Army considers both lead-based paint and lead-contaminated paint to be potentially hazardous to children if they are disturbed or deteriorating.

(2) Lead in Air. All air samples were below the Occupational Safety and Health Administration standard for lead in air.

(3) Lead in Dust. Lead in dust wipe sample results exceeded the National Guard Bureau (NGB) Region North and U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended decontamination level for lead in dust on frequently contacted surfaces. There were elevated levels of lead in dust in the converted indoor firing range (IFR) storage room. Lead from the converted IFR storage room can be tracked into other areas of the armory. The NGB Region North Industrial Hygiene Office was notified of these results.

(4) Child Lead Exposure. Many lead in dust sample results exceeded the Environmental Protection Agency (EPA) and the State of Maryland lead exposure levels for children. These conditions pose a significant health hazard from lead exposure to children using this facility that warrants clean up to these limits before allowing children to continue to use this armory.

b. <u>Asbestos Exposure</u>. Some pipe insulation presumed to be asbestos-containing was exposed. There were also presumed asbestos vinyl floor tiles in the armory. Some of these tiles were buckling due to moisture. If additional damage occurs in the future, the asbestos tiles and pipe insulation may become friable and asbestos fibers may be released. The MDARNG state occupational health nurse has been informed of this finding.

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2586 of 5269

c. Mold Exposure. Excessive moisture in the armory has caused mold growth.

d. <u>Safety Hazards</u>. Some ceiling tiles have buckled due to water damage. Occasionally these ceiling tiles become dislodged when building occupants bounce basketballs on the drill floor.

e. <u>Additional Building Concerns</u>. The point of contact stated that the drinking water occasionally appears to be rusty or cloudy. He also stated that the armory does not have enough electrical circuits.

3. RECOMMENDATIONS.

a. <u>Lead Exposure</u>. The Department of Defense Risk Assessment Code (RAC) for health hazards associated with lead exposure in the LTC James Victor McCool Armory is RAC 3.

(1) Occupational Exposure. Clean all areas in and adjacent to the former IFR and other areas where sampling results showed elevated levels of lead. Comprehensive guidelines for cleaning are in Appendix F. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after clean up. 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. Pending clean up, restrict access to the former IFR by keeping it locked. Post a sign warning against use of the room except in an emergency. Ensure that personnel wear disposable gloves and disposable coveralls to prevent tracking lead out when working in the former IFR. Wear disposable gloves and disposable coveralls to fead.

(2) Child Exposure. Address all potential lead hazards before extending use of this facility to children. If children will be using this facility, clean surfaces to the EPA lead in dust standard for young children and to the NGB Region North and USACHPPM decontamination level for lead in dust on all other surfaces. Repair and stabilize deteriorated paint.

b. <u>Asbestos Exposure</u>. The RAC for health hazards associated with asbestos exposure is RAC 1. Determine if pipe insulation is asbestos-containing material. If it is determined to be asbestos it must be encapsulated or removed as soon as possible. Repair or replace vinyl floor tiles as soon as possible.

c. <u>Mold Exposure</u>. The RAC for health hazards associated with mold exposure is RAC 4. Reduce the moisture level in the air, repair leaks, increase ventilation (if weather is cold and dry), or dehumidify (if weather is warm and humid). Dehumidifying can be accomplished either by closing the windows and turning on the window air conditioning units or by using a portable dehumidifier. Abate all areas of visible mold. Remove and replace ceiling tiles with mold

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growth. Vacuum or damp wipe walls, floors and other surfaces with mold growth with water and mild detergent and allow to dry. For additional guidance refer to USACHPPM TG 278, Industrial Hygiene/ Preventive Medicine Mold Assessment Guides, and USACHPPM TG 277, Army Facilities Management Information Document on Mold Remediation Issues.

d. <u>Safety Hazards</u>. The RAC for safety hazards associated with the ceiling tiles is RAC 3. Replace loose ceiling tiles.

e. Additional Building Concerns.

(1) Obtain the services of a professional electrician to review the electrical system throughout the armory to determine whether there are enough circuits. No RAC assigned.

(2) Test the drinking water from water fountains and faucets for lead and other contaminants. The RAC for health hazards associated with the drinking water is RAC 3.

ES-3

TABLE OF CONTENTS

Paragraph

Page

1.	REFERENCES	t
2.	PURPOSE OF EVALUATION	1
3.	AUTHORITY	1
4.	BACKGROUND INFORMATION	1
5.	FACILITY EVALUATION	l
6.	ASSESSMENT CRITERIA FOR LEAD	3
7.	SAMPLING RESULTS, DISCUSSION AND CONCLUSIONS	3
8.	RECOMMENDATIONS	- 5
9.	SITE MAPS	6
10.	ADDITIONAL ASSISTANCE	6

APPENDICES

Α.	REFERENCES	A-1
В.	SAMPLING SHEETS AND LAB ANALYSES	B- 1
C.	PHOTOGRAPHS	C-1
D	ASSESSMENT CRITERIA FOR LEAD	D-1
Ε.	MOLD GUIDANCE	E-1
F	LEAD CLEANING GUIDANCE	F -1
G.	SITE MAPS	G-1



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

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MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS LTC JAMES VICTOR MCCOOL ARMORY ELKTON, MD PROJECT NO. 55-ML-01ED-03/05 16 JULY 2003

1. REFERENCES. See Appendix A.

2. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard (MDARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions. This survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee for the Defense Occupational and Environmental Health Readiness System.

3. AUTHORITY. Fax, National Guard Bureau (NGB) Region North Industrial Hygiene Office (NGB-AVS-SI-IH/Ms. Non-Responsive, 28 February 2003, subject: SAB

4. BACKGROUND INFORMATION.

a. <u>Armory Mission</u>. The Total Light Anti-Tank Unit from Elkton Armory serves Aberdeen Proving Ground by providing force protection and perimeter security for the base.

b. Date of Construction. 1911.

c. <u>Facility Use by Children</u>. The point of contact (POC) stated that children occupy the armory occasionally. The Maryland Military Department is currently advertising Elkton Armory as available for rental for activities that include young children.

5. FACILITY EVALUATION.

a. <u>Sampling</u>. Samples were collected for lead in air, on surfaces (wipe samples), and in bulk paint to determine the presence of lead hazards. Sample locations and results are shown in Appendix B.

b. Physical Condition of Facilities.

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(1) Paint. Staff Sergeant (SSG) Non-Responsive Environmental Compliance Assessment Coordinator for the MDARNG, stated that there are no records of lead-based paint abatement for this armory. Some of the paint was deteriorated in the drill hall and in Room 204.

(2) Asbestos. SSG stated that there are no records of an asbestos abatement in this armory. There is presumed asbestos-containing insulation on the pipes throughout the building. Some of the presumed asbestos-containing material is exposed. There are also some vinyl floor tiles which are presumed to be vinyl asbestos tiles.

(3) Mold. There is mold in the armory on some ceiling tiles.

(4) Safety Hazards. Building occupants bounce basketballs on the drill floor, and this causes ceiling tiles to fall onto the floor.

c. Other Building Concerns.

(1) The POC stated that the armory does not have enough electrical circuits. Three circuits run the air conditioners and fans.

(2) Some panels in the ceiling have buckled due to water damage.

(3) Some vinyl floor tiles have buckled due to water damage.

(4) The drinking water occasionally appears to be rusty or cloudy.

d. <u>Safety and Industrial Hygiene Programs</u>. The only written program records at the armory are for the Hazardous Communication Program.

e. <u>Heating, Ventilation, and Air-Conditioning System</u>. Ventilation and air are provided mainly by window-mounted air conditioning units and the manual operation of windows when the building is not being heated. The building is heated by steam heated radiators.

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

g. <u>Lighting</u>. All areas of the armory were judged to be adequately lit and occupants reported no areas of deficient lighting.

h. <u>Converted Indoor Firing Range</u>. SSG stated that all lead was abated in the indoor firing range (IFR) during its conversion. The room is being used as a storage area.

i. Photographs. See Appendix C.

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6. ASSESSMENT CRITERIA FOR LEAD. See Appendix D for details.

a. <u>Lead in Air.</u> The Army occupational exposure limit for lead in air is the Occupational Safety and Health Administration (OSHA) 8-hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter (μ g/m³) of air.

b. <u>Lead in Dust.</u> 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.

c. <u>Lead in Paint</u>. Paint containing lead levels of 0.5% or more by weight in dried solid (also reported as 5000 milligrams per kilogram) is considered to be lead-based paint according to both Federal and Maryland State Regulations. Paint containing lead levels of more than 0.7 milligrams per square centimeter is considered to be lead-based paint according to Maryland State Regulations. In Army Regulation 420-70, Buildings and Structures, lead-contaminated paint is defined as any paint containing detectable amounts of lead. The Army considers lead-contaminated paint to be potentially hazardous to children if it is disturbed or deteriorating.

d. <u>Lead Carcinogenicity</u>. The Department of Health and Human Services National Toxicology Program (NTP) released the Report on Carcinogens, Eleventh Edition in February 2005. The NTP report lists "lead and lead compounds" as "reasonably anticipated to be human carcinogens".

7. SAMPLING RESULTS, DISCUSSION AND CONCLUSIONS.

a. <u>Lead in Air</u>. All air sample results were below the laboratory analytical detection limit for lead of 3 μ g/m³ as well as the OSHA standard of 50 μ g/m³ for lead in air.

b. <u>Lead in Paint</u>. Samples of deteriorated paint were analyzed for lead. One sample result was 1.118% and is lead-based paint. Another sample result was 0.359% and is lead-contaminated paint.

c. <u>Lead in Dust</u>. Two of seventeen lead in dust wipe sample results, located on the top of the refrigerator in the kitchen and on the base of the former metal target stands in the converted IFR, exceeded the NGB Region North and USACHPPM recommended decontamination level of 200 μ g/ft² for lead in dust on frequently contacted surfaces. The converted range room metal target stand surface wipe result was 318 μ g/ft². The top of the refrigerator surface wipe sample was 478 μ g/ft². Four lead in dust sample results exceeded the EPA and the State of Maryland

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lead exposure levels for children. There are elevated levels of lead in dust in the converted IFR storage room. Personnel using this room are potentially exposed to lead in dust, 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 outside of areas thought only to contain lead.

d. <u>Child Lead Exposure</u>. Lead in dust results from several areas in the armory greatly exceeded the regulatory limits for children 6 years of age and under. Two deteriorated paint samples were found to be lead-based and lead-contaminated paint. Lead is being tracked throughout the facility. Although children are unlikely to occupy this armory for more than the minimum 60 hours per year required for the regulatory limits to apply, we believe that these conditions pose a significant health hazard from lead exposure to children using this facility that warrants clean up to the minimum limits before allowing children to continue to use the armory. The NGB Region North Industrial Hygiene Office was notified of these results.

e. <u>Asbestos Exposure</u>. Some pipe insulation is presumed to be asbestos-containing and is exposed. If it is determined to be asbestos it must be encapsulated or removed as soon as possible. There are also presumed asbestos vinyl floor tiles in the armory. Some of the presumed asbestos tiles are buckling due to moisture in the armory. If further damage occurs in the future, the asbestos tiles and the pipe insulation 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. The Maryland state occupational nurse has been informed of this finding.

f. <u>Mold and Moisture Exposure</u>. Excessive moisture in the armory has caused mold growth. Mold and sources of moisture must be eliminated. See Appendix E for guidelines in identifying, removing, and abating mold.

g. <u>Safety Hazards</u>. Some panels in the ceiling have buckled due to water damage. Building occupants bounce basketballs on the drill floor and this causes ceiling tiles to fall onto the floor.

h. Other Building Concerns.

(1) The POC stated that the armory does not have enough electrical circuits. Three circuits run the air conditioners and fans.

(2) The drinking water occasionally appears rusty or cloudy.

8. RECOMMENDATIONS.

a. <u>Lead Exposure</u>. The Risk Assessment Code (RAC) for health hazards associated with lead exposure is RAC 3.

(1) Occupational Exposure. Clean all areas in and adjacent to the former IFR and other areas where sampling results showed elevated levels of lead. Comprehensive guidelines for cleaning are in Appendix F. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after clean up. 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. Pending clean up, restrict access to the former IFR by keeping it locked. Post a sign warning against use of the room except in an emergency. Ensure that personnel wear disposable gloves and disposable coveralls to prevent tracking lead out when working in the former IFR. Wear disposable gloves and disposable coveralls of lead.

(2) Child Exposure. Address all potential lead hazards before extending use of this facility to children. If children will be using this facility, clean surfaces to the EPA lead in dust standard for young children and to the NGB Region North and USACHPPM decontamination level for lead in dust on all other surfaces. Repair and stabilize deteriorated paint.

b. <u>Asbestos Exposure</u>. The RAC for health hazards associated with asbestos exposure is RAC 1. Determine if pipe insulation is asbestos-containing material. If it is determined to be asbestos it must be encapsulated or removed as soon as possible. Repair or replace vinyl floor tiles as soon as possible.

c. <u>Mold Exposure</u>. The RAC for health hazards associated with mold exposure is RAC 4. Reduce the moisture level in the air, repair leaks, increase ventilation (if weather is cold and dry), or dehumidify (if weather is warm and humid). Dehumidifying can be accomplished either by closing the windows and turning on the window air conditioning units or by using a portable dehumidifier. Abate all areas of visible mold. Remove and replace ceiling tiles with mold growth. Vacuum or damp wipe walls, floors and other surfaces with mold growth with water and mild detergent and allow to dry. For additional guidance refer to USACHPPM TG 278, Industrial Hygiene/ Preventive Medicine Mold Assessment Guides, and USACHPPM TG 277, Army Facilities Management Information Document on Mold Remediation Issues.

d. <u>Safety Hazards</u>. The RAC for safety hazards associated with the ceiling tiles is RAC 3. Replace loose ceiling tiles.

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2594 of 5269

e. Additional Building Concerns.

(1) Obtain the services of a professional electrician to review the electrical system throughout the armory to determine whether there are enough circuits. No RAC assigned.

(2) Test the drinking water from water fountains and faucets for lead and other contaminants. The RAC for health hazards associated with the drinking water is RAC 3.

9. SITE MAPS. See Appendix G.

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



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

APPROVED:



Technical Manager Industrial Hygiene Field Services Program

APPENDIX A

REFERENCES

A-1

APPENDIX

REFERENCES

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11. Illuminating Engineering Society of North America, ANSI/IESNA. RP-I-1993, Office Lighting.

12. ACGIH, Industrial Ventilation: A Manual of Recommended Practices, 25th ed. 2003.

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13. U.S. Army National Guard Bureau, Design Guide 415-2 Design Guide for Logistics Facilities, 30 November 1990.

14. EPA 40 CFR, Part 61--National Emission Standards for Hazardous Air Pollutants, Subpart M--National Emission Standard for Asbestos.

A-3

MDARNG IH Baseline Surveys, Elkton, MD, Project No. 55-ML-01ED-03/05

APPENDIX B

SAMPLING SHEETS AND LAB ANALYSES

B-1

Sample	Type of	Location		Result
Numbers	Sample			µg/ft²
EL W01	Wipe	Drill Floor Entrance	0839	39
EL W02	Wipe	Drill Floor Middle	0840	BDL
EL W03	<mark>Wipe</mark>	Drill Floor Back of Drill Hall	<mark>0841</mark>	<mark>59</mark>
EL W04	<mark>Wipe</mark>	Drill Floor Window Sill	<mark>0843</mark>	<mark>45</mark>
EL W05	Wipe	Recreation Room Lunch Table	0846	BDL
EL W06	Wipe	Kitchen Counter	0854	BDL
ELW07	<mark>Wipe</mark>	Top of Refrigerator	_	<mark>478</mark>
EL W08	<mark>Wipe</mark>	Converted Range Floor	<mark>0848</mark>	<mark>120</mark>
EL W09	Wipe	Converted Range Floor Original Air Outlet	0849	BDL
EL W10	Wipe	Converted Range Floor Outside Wall	-	BDL
EL W11	Wipe	Converted Range Room Air Intake	<mark>0847</mark>	<mark>82</mark>
EL W12	Wipe	Converted Range Room Original Wall Plenum	<mark>0848</mark>	<mark>81</mark>
EL W13	Wipe	Converted Range Room New Wall Plenum	_	32
EL W14	Wipe	Converted Range Room Metal Target Stands	<mark>0848</mark>	<mark>318</mark>
EL W15	Wipe	Converted Range Room Ceiling Sound Proofing	0871	BDL
EL W16	Wipe	Desk Top	0861	BDL
EL W17	Wipe	Distance Learning Classroom	0863	BDL
Bulk				% Load
Samples				70 Leau
EL Bulk 1	Bulk	Drill Hall	0862	0.359
EL Bulk 2	Bulk	Room 204 Office	0861	1.118
Air Samples				mg/m ³
ELAIR01	Air	Drill Hall	0862	BDL
ELAIR02	Air	Room 205	0863	BDL
ELAIR03	Air	Knotty Pine Room	0846	BDL

TABLE: Lead in Dust Wipe and Bulk Paint Sample Locations, Photograph Numbers, and Analytical Results

Note: BDL = Below Detection Limit.



TEST REPORT Page 1 of 2 8/11/03

Submitted To: Non-Response

US Army CHPPM Bldg. 1570 Stark Road APG, MD 21015

Reference Data: Client Sample No.: P.O. No.: Sample Location: Sample Type: Method Reference: DCL Set ID No.: DCL Sample ID No.: Sample Receipt Date: Preparation Date: Analysis Date:

Lead ELAIR01 through ELAIR05 Not Available Elkton Armory Filter NIOSH 7300 03-S-3782 03-23206 through 03-23210 8/5/2003 08/06/03 08/07/03

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

The sample condition upon receipt was acceptable except where noted.

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

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

Non-Responsive	

Analyst



CINCINNATI OFFICE 4388 GLENDALE-MILFORD ROAD CINCINNATI, OHIO 45242-3708 513 733-5336, FAX 513 733-5347

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

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TEST REPORT Page 2 of 2 03-S-3782

Results Lead

Client #	DCL #	Sample Volume (L)	µg/sample	mg/m ³
ELAIR01	03-23206	0	ND	-
ELAIR02	03-23207	293	ND	<0.003
ELAIR03	03-23208	300	ND	<0.003
ELAIR04	03-23209	304	ND	<0.003
ELAIR05	03-23210	0	ND	-
	Prep Blank		ND	
<pre>% Recovery</pre>	LCS		99.	
RPL			1.	

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





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RESERVOIRS ENVIRONMENTAL, INC.

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

TABLE ANALYSIS:

LEAD BY WIPE SAMPLING

RES Job Number:	RES 95626-1
Client:	USACHPPM
Client Project Number / P.O.:	None Given
Client Project Description:	MD National Guard
Date Samples Received:	July 18, 2003
Analysis Type:	USEPA SW846 3050B / AA(7420)
Turnaround:	3-5 Day
Date Samples Analyzed:	July 24, 2003

Client	Lab	Sample	LEAD	Detection	LEAD
ID Number	ID Number	Area	(µg)	Limit	CONCENTRATION
		(sq.ft.)		(µg/sq.ft.)	(µg/sq.ft.)
ELBLANK1	EM 796343	0.11	BDL	23	BDL .
ELWO1	EM 796344	0.11	4.3	23	39
ELWO2	EM 796345	0.11	BDL	23	BDL
ELWO3	EM 796346	0.11	6.5	23	59
ELWO4	EM 796347	0.11	5.0	23	45
ELW05	EM 796348	0.11	BDL	23	BDL
ELBLANK2	EM 796349	0.11	BDL	23	BDL
ELWO6	EM 796350	0.11	BDL	23	BDL
ELWO7	EM 796351	0.11	52.6	23	478
ELWO8	EM 796352	0.11	13.2	23	120
ELWO9	EM 796353	0.11	BDL	23	BDL
ELW10	EM 796354	0.11	BDL	23	BDL
ELBLANK3	EM 796355	0.11	BDL	23	BDL
ELW11	EM 796356	0.11	9.0	23	82
ELW12	EM 796357	0.11	8.9	23	81
ELW13	EM 796358	0.11	3.5	23	32
ELW14	EM 796359	0.11	35.0	23	318
ELW15	EM 796360	0.11	BDL	23	BDL
ELBLANK4	EM 796361	0.11	BDL	23	BDL
ELW16	EM 796362	0.11	BDL	23	BDL
ELW17	EM 796363	0.11	BDL	23	BDL

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

BDL = Below Detection Limit

Page 2 of 2

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RESERVOIRS ENVIRONMENTAL, INC.

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

TABLE ANALYSIS: LEAD IN PAINT

RES Job Number:	RES 95628-1
Client:	USACHPPM
Client Project Number / P.O.:	None Given
Client Project Description:	None Given
Date Samples Received:	July 18, 2003
Analysis Type:	USEPA SW846 3050B / AA (7420)
Turnaround:	3-5 Day
Date Samples Analyzed:	July 22, 2003

Client	Lab	Detection	LEAD
ID Number	ID Number	Limit	CONCENTRATION
		(%)	(%)
ELBULK1	EM 796367	0.005	0.359
ELBULK2	EM 796368	0.005	1.118

Page 2 of 2



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2604 of 5269

APPENDIX C

PHOTOGRAPHS

C-1

Elkton Armory Photographs

Photo #	Location		
0839 Drill Floor Entrance/ Lead Wipe Sample			
0840	Drill Floor Middle/ Lead Wipe Sample		
0841	Drill Floor Back of Drill Hall/ Lead Wipe Sample		
0842	Drill Floor Back of Drill Hall/ Lead Wipe Sample		
0843	Drill Floor Window Sill/ Lead Wipe Sample		
0844	Drill Floor Window Sill/ Deteriorated Paint		
0845	Drill Floor Window Sill/ Deteriorated Paint		
0846	Recreation Room Lunch Table/ Lead Wipe and Air Samples		
0847	Converted Range Room Air Intake/ Lead Wipe Sample		
0010	Converted Range Room Metal Target Stands and Original Wall		
0646	Plenum/ Lead Wipe Sample		
0849 Converted Range Floor Original Air Outlet/ Lead Wipe Sampl			
0850	Presumed Vinyl Asbestos Floor Tiles		
0852	Locker Room		
0854	Kitchen Counter/ Lead Wipe Sample		
0859	Chipping and Deteriorated Paint		
0860	Drill Hall/ Loose Ceiling Tiles		
0861	Room 204 Office Desk Top/ Lead Wipe and Bulk Paint Samples		
0862	Drill Hall/ Lead in Air and Bulk Paint Samples		
0863	Distance Learning Classroom Room 205/ Lead Wipe and Air Samples		
0864	Locker Room/ Loose Ceiling Tiles		
0865-68	Exposed Pipe Insulation		
0871	Converted Range Room Ceiling Sound Proofing/ Wipe Sample		



FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2607 of 5269

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2609 of 5269



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2610 of 5269



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2611 of 5269



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2612 of 5269


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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2613 of 5269



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2614 of 5269



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2617 of 5269



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2618 of 5269



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2619 of 5269



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2629 of 5269



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MDARNG IH Baseline Surveys, Elkton, MD, Project No. 55-ML-01ED-03/05

APPENDIX D

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE

ASSESSMENT CRITERIA FOR LEAD

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D-1

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

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

a. EPA standards (40 CFR 745.227(e) (8) (viii)) and State of Maryland standards are not directly applicable because they are developed for floors (40 μ g/ft²), windowsills (250 μ g/ft²)and window troughs (400 μ g/ft²) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

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

c. OSHA cites a level of 200 μ g/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 $200 \ \mu g/ft^2$ is a safe surface contamination level for adult exposures. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

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

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

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of $50 \mu g/m^3$ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

MDARNG IH Baseline Surveys, Elkton, MD, Project No. 55-ML-01ED-03/05

APPENDIX E

MOLD GUIDANCE

E-1

Army Facilities Management Information Document on Mold Remediation Issues

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

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

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

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

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

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

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

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

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

REMEDIATION PLANNING

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

REMEDIATE MOISTURE AND MOLD PROBLEMS

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

REMEDIATION PROCEDURES

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

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

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

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

FOUR REMEDIATION LEVELS

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

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

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

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

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

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

Contaminated materials that cannot be cleaned should be sealed and doublebagged 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 doublebagged 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.

TG 277

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 doublebagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

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

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

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

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft²) follow Level I guidance for PPE and containment and for a areas (>10 ft²) follow Medium (Level II) or when greater than 100 ft² follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

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

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

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

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

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

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

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

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

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

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

The following procedures are recommended:

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

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

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

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

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

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

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

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

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

HAZARD COMMUNICATION

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

CONCLUSION

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

REFERENCES

- 1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.
- American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.
- New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.
- 4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.
- 5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.
- 6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.
- 7. Occupational Safety & Health Administration. *Respiratory Protection Standard*, 29 *Code of Federal Regulations 1910.134*. 63 FR 1152. January 8, 1998.
- 8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force*, AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

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

Water Damage Cleanup and Mold Prevention

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

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

Ξ

P	
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

Ξ

£ 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 f with Mold	for Remediating Building Mater Growth Caused by Clean Wate	rials pr*	
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment	
SMALL - Total Surface Area Affected Less Than 10 square feet (ft ²)				
Books and papers	3			
Carpet and backing	1, 3			
Concrete or cinder block	1, 3			
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3	Minimum		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3	N-95 respirator, gloves, and goggles	None required	
Upholstered furniture & drapes	1, 3			
Wallboard (drywall and gypsum board)	3			
Wood surfaces	1, 2, 3			

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

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

Disposable Protective Clothing

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

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

APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

Containment Tips

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

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

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

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

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278 February 2002



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Table of Contents

Introduction
Safety Tips While Investigating And Evaluating Mold And Moisture Problems
Communicate With Building Occupants At All Stages Of Process, As Appropriate 3
Routine Investigation And Evaluation Of Moisture And Mold Problems
Assessments Requiring Sampling 3
References 4
APPENDIX A: Mold Investigation Decision Logic
APPENDIX B: Mold Remediation Guidelines8
APPENDIX C: Personal Protective Equipment11
APPENDIX D: Containment Guidance13

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

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

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

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

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination².

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

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

Communicate with building occupants at all stages of process, as appropriate¹.

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

Routine Investigation and Evaluation of moisture and mold problems³.

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

Assessments Requiring Sampling

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

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

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination².

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air⁴. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control⁴."

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

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

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MOLD INVESTIGATION DECISION LOGIC



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MOLD INVESTIGATION DECISION LOGIC NOTES:

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

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

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

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

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

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities³. Confirm negative pressure with smoke tubes.

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

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

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

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

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

APPENDIX B

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

Mold Remediation Guidelines

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

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

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

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

TG 278

*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.

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APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

Containment Tips

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

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

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

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

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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MDARNG IH Baseline Surveys, Elkton, MD, Project No. 55-ML-01ED-03/05

APPENDIX F

LEAD CLEANING GUIDANCE

HUD TECHNICAL GUIDELINES FOR THE EVALUATION AND CONTROL OF LEAD-BASED PAINT HAZARDS IN HOUSING 1998

CHAPTER 14: CLEANING

Ste	ep-t	by-Step Summary 14–3
I.	Int	troduction
	Α.	Performance Standard
	В.	Small Dust Particles
	C.	Difficulties in Cleaning 14-5
		1. Low Clearance Standards 14–5
		2. Worker Inexperience
		3. High Dust-Producing Methods and/or Inadequate Containment 14–6
		4. Deadlines
II.	Со	ordination of Cleaning Activities 14-6
	Α.	Checklist
	В.	Equipment Needed for Cleaning 14-6
	C.	Waste Disposal 14–7
III.	Cle	eaning Methods and Procedures 14-7
	Α.	Containment 14–7
	Β.	Basic Cleaning Methods: Wet Wash and Vacuum
		Cleaning Techniques
		1. HEPA Vacuuming
		2. Wet-Detergent Wash
		3. The HEPA/Wet Wash/HEPA Cycle
		4. Sealing Floors
IV.	Or	der of Cleaning Procedures During Lead Hazard Control 14–16
	Α.	Precleaning Procedures
	Β.	Ongoing Cleaning During the Job
	C.	Daily Cleaning Procedures
		1. Large Debris
		2. Small Debris
		3. Exterior Cleaning
		4. Worker Protection Measures
		5. Maintaining Containment

_

V.	Or	der of Final Cleaning Procedures After	
	Le	ad Hazard Control	14–19
	Α.	Final Cleaning	14–19
		1. Decontamination of Workers, Supplies, and Equipment	14–19
	В.	Preliminary Visual Examination	14–20
	С.	Surface Painting or Sealing of Nonfloor Surfaces	14–20
	D.	Final Inspection	14–20
	Ε.	Recleaning After Clearance Failure	14–20
VI	. Cle	eaning Cost Considerations	1/ 01
		•	14–21
	Α.	Initial Clearance Test Failure Rates	14–21 14–21
	А. В.	Initial Clearance Test Failure Rates Key Factors In Effective Cleaning	14–21 14–21 14–21
	А. В. С.	Initial Clearance Test Failure Rates Key Factors In Effective Cleaning Special Problems	14–21 14–21 14–21 14–21
VI	A. B. C. I. A	Initial Clearance Test Failure Rates Key Factors In Effective Cleaning Special Problems Iternative Methods	14–21 14–21 14–21 14–21 14–22
VI	A. B. C. I. A A.	Initial Clearance Test Failure Rates Key Factors In Effective Cleaning Special Problems Iternative Methods Vacuums	14–21 14–21 14–21 14–21 14–22 14–22

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Step-by-Step Summary



- 1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
- 2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
- 3. Have sufficient cleaning equipment and supplies before beginning work.
- 4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
- 5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
- 6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
- 7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
- 8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
- 9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
- 10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
- 11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
- 12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
- 13. Paint or otherwise seal treated surfaces and interior floors.
- 14. Conduct a clearance examination (see Chapter 15).
- 15. If clearance is not achieved, repeat the final cleaning.



- 16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.
- 17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.
- 18. Cleaning equipment list:
 - HEPA vacuums.
 - Detergent.
 - Waterproof gloves.
 - Rags.
 - Sponges.
 - Mops.
 - Buckets.
 - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
 - 6-mil plastic bags.
 - Debris containers.
 - Waste water containers.
 - Shovels.
 - Rakes.
 - Water-misting sprayers.
 - 6-mil polyethylene sheeting (or equivalent).

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris and dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning

procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 µg/ft² on floors.
- ♦ 500 µg/ft² on interior window sills (stools).
- 800 µg/ft² on window troughs (the area where the sash sits when closed).
- 800 μg/ft² on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.



2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?

- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).



C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and 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 finedust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.



Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards and were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and prefilter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the prefilter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a highphosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several



Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wetwash process.

Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

✤ First, the area is HEPA vacuumed.


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Chapter 14: Cleaning

- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.



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14–13 FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2686 of 5269

Figure 14.4c (continued)

Wash all surfaces with suitable detergents

Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces



Wet Mop Floor



Don't Dry Sweep

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Figure 14.4d (continued)

HEPA vacuum all surfaces a final time HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the



Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's



Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.



belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will



Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- ♦ Securing debris/plastic.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6mil 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 plasticremoval process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).



Figure 14.8a Pick Up Corners of Plastic Sheeting.



Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).



Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This



option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dustretaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table	14 1	Initial	Cleaning	Wine-Test	Failure	Rates for	Various	Abatement	Strategies
labic	17.1	million	cicaring	vvipc-icst	i anui c	Rates IOI	various	Abatement	Juaccyles

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.

Mass Removal Efficiency Percentages Cycle Number **Cleaning Method** Central Central **HEPA Vacuum** Portable Vacuum—Plain Vacuum—Agitator Vacuum—Plain Tool Head Tool 1 34.7 71.0 17.5 55.4 2 47.0 80.2 61.2 23.0 3 51.9 85.9 66.3 26.6 87.8 67.0 4 56.0 29.4 59.3 88.9 5 72.1 32.5 6 61.6 91.2 74.4 34.9 7 63.8 93.1 76.4 36.5 67.5 95.4 38.1 8 77.5 9 67.5 97.7 78.7 40.1 67.2 80.2 10 100.0 41.7 11 102.3 80.2 41.7 44.8 12 104.6 84.1 84.5 13 104.6 46.8 14 103.8 84.5 48.4 15 49.6 50.8 16 17 52.4 18 53.6 54.4 19 20 55.2

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) Effectiveness of Clean-up Techniques for Leaded Paint Dust

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MDARNG IH Baseline Surveys, Elkton, MD, Project No. 55-ML-01ED-03/05

APPENDIX G

SITE MAPS

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Industrial Hygiene Study

National Guard Facility Elkton Readiness Center 101 Railroad Avenue Elkton, Maryland 21921-5535

Prepared for:

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Prepared by:

The El Group, Inc. 2101 Gateway Centre Blvd. Morrisville, North Carolina 27560

Report Date: December 30, 2008

Project ID: IHMO080101.03



Senior Industrial Hygienist



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TABLE OF CONTENTS

Executive Summary	3
Operation Description	4
Noise	4
Lead Testing	4
Lighting	6
Indoor Air Quality	6
Suspect ACBM	8
Maintenance Bay Inspection	8
Ventilation Assessment	8
Additional Items	9
Limitations	9
References	10

List of Appendices

Appendix A:	Photographs
Appendix B:	Laboratory Analysis Report

2

EXECUTIVE SUMMARY

An industrial hygiene survey was conducted August 7, 2008 at the Readiness Center Facility Identification No.495 located in Elkton, 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, top of kitchen refrigerator, hallway floor at arms vault and Maintenance Room shelf.

Indoor air quality parameters were also evaluated during the assessment. Indoor air quality was found to be within those parameters established by the Environmental Protection Agency (EPA) and American Society of Heating, Refrigerating, and Air-conditioning Engineers, Inc. (ASHRAE). The firing range is inactive but could have contributed to lead exposure to building occupants. Lead identified in the HVAC system could originate from outdoor environmental sources.

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.

3

Operation Description

The Elkton Readiness Center primarily serves as an office setting and equipment storage facility. The facility consists of a two story garage facility plus a 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 stone. The interior walls were composed of concrete block and in some areas were finished with drywall or plaster. The roof of the facility consisted of a pitched shingle roof as well as a built-up roofing system. The heating, ventilating, and air conditioning system (HVAC) consisted of window unit air conditioners and a radiator heating system. The floors were composed of a poured concrete slab and in some areas were finished with 9"x9" and 12"x12" vinyl floor tiles. The ceilings were generally composed of wood decking and in some areas were finished with a suspended drop ceiling system.

An attached garage at the rear of the facility is equipped with an inoperable local exhaust ventilation system. Infrequent minor auto repairs are performed. The area is primarily used for cold weather storage.

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 locker room which was once an indoor firing range.

Various surfaces within the facility were screened for lead using surface/wipe samples and the collection of air samples. Surface/wipe samples were collected using Ghost WipeTM samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 μ m MCE cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, MD for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix B.

Lead Testing Results Summary						
Location	Air ug/m ³	Surface ug/ft ²	Bulk	Chip %Pb		
495-1: Range/Supply	<2.1					
495-5: Air Blank	<3					
495-3: Supply Clerk	<2.2					
495-L-4: B01			0.11			
495-L-6: 101				0.97		
495-L-7: 102				0.19		
495-L-10: 205A				0.098		
495-L-11: 203A				4.5		
495-L-1: B-11 Range		110				
495-L-2: B-08 Arms Vault		130				
495-L-3: B01 Shelf Top		470				
495-L-5: B04 Kitchen Fridge top		3,200				
495-L-8: 107 Floor		<110				
495-L-9: 203A Floor		<110				
495-L-12: Blank		<12				
Criteria	50	200	5,000	0.5		

Key: ND – None Detected PB – Lead

Detectable levels of lead were identified in the former range, arms vault, maintenance office and kitchen. The National Guard Bureau currently utilizes 200 ug/ft² as a benchmark for identifying contaminated surfaces. In the" Derivation of Wipe Surface Screening Levels for Environmental Chemicals", the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft² is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, HUD levels of 40 μ g/ft² on floors and 250 μ g/ft² on windowsills should be observed.

No detectable levels of lead were identified in those air samples collected. Currently, OSHA observed an 8-hour time weighted average of 50 ug/m³.

5

Deteriorated paint was observed throughout the facility. Delaminated paint was mostly due to age along with prolonged exposure to elevated humidity levels. Lead-based paint chips were identified in the drill hall and 2nd floor latrine.

<u>Lighting</u>

A lighting assessment was conducted throughout the facility. The survey was conducted with large bay doors closed. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. 98047EL). The light meter was last calibrated on February 22, 2008. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Location	Foot Candles	Lighting	Lighting					
101: Drill Floor	57-109	30-50	Yes					
102: Latrine	39-62	5	Yes					
109: Office	47-59	30-50	Yes					
107: Office	39-58	30-50	Yes					
108: Latrine	30-51	5	Yes					
106: Office	52-64	30-50	Yes					
103: Recruiter	7-14	30-50	NO					
207: Locker	26-51	7	Yes					
205: Classroom	29-66	30-50	Yes					
Basement Hall	56-78	5	Yes					
B11: Storage/Range	30-90	30	Yes					
B03: Locker	17-23	7	Yes					
B10: Supply Clerks	44-120	30-50	Yes					
B01: Maintenance	21-93	75	Yes					
B05: Latrine	36-58	5	Yes					
B05: Locker/Latrine	24-49	7	Yes					
B04: Kitchen	28-63	50	Yes					

Light Survey Assessment Summary

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 71.6 to 84.2 \degree F with relative humidity readings ranging from 45.2 to 65.5%. During the survey, CO₂ levels ranged from 480 to 702 ppm.

Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,098 ppm (398 ppm + 700 ppm). The results of the testing met the ASHRAE guidelines.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)			
Outdoors	72.6	58.2	398	0			
Basement Hall	78.6	60.6	533	0			
B-11 Storage/Range	78.8	61.2	519	0			
Basement Locker	78.3	60.9	527	0			
Supply Room-B10	78.0	61.0	528	0			
Maintenance Office- B01	78.4	61.7	541	0			
Latrine-B05	77.9	65.4	567	0			
Locker-B07	78.9	65.5	519	0			
Kitchen-B04	79.7	62.5	702	0			
Drill Floor-101	84.2	52.8	480	0			
Men's Latrine-102	82.5	48.0	615	0			
Storage-109	73.4	45.8	604	0			
Office-107	71.6	47.2	518	0			
Latrine-108	77.2	46.9	509	0			
Office-106	72.5	45.2	622	0			
Recruiter-103	79.7	60.6	615	0			
Classroom-207	84.2	53.5	538	0			
Classroom-205	84.4	53.5	522	0			
Criteria	73.0-79.0	30-50	<1,084	<9.0			

IAQ Assessment Summary

Elevated humidity levels were identified throughout the basement area, likely due to insufficient exhaust ventilation associated with the shower facilities.

Limited fungal growth was identified in the Locker Room B03 and appears to be caused by sub-grade water intrusion.

Water damaged ceiling tiles/ceiling materials were identified in 101 (Drill Hall), 110, 109, 207, 205, 203, 203A, B06 as well as in B05.

Air samples were collected from several areas indoors. Rooms B03, 103 and 207 were assessed as well as outside as control. A tape sample was collected of suspect fungal growth observed in Room B03. Indoor concentrations ranged from 1,100 spores/m³ to 2,200 spores/m³ compared to an outdoor concentration of 16,000 spores/m³. Indoor samples were found to have similar rank order. Based on the review of sample data, indoor air quality in relation to airborne fungal spore counts appear to be acceptable.

The tape lift sample collected in room B03 was found to have moderate levels of *Cladosporium* (81,000 spores/in²), few counts of *Aureobasidium* (9,720 spores/in²) and hyphal fragments (11,900 spores/in²).

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 canvas wrapped fiberglass and air cell TSI in basement. Approximately 15 linear feet of the air cell is damaged and should be removed.

One air sample for asbestos was collected in the basement maintenance room with a concentration of 0.007 fibers/cc.

Maintenance Bay

The maintenance bay was not found to contain a local exhaust ventilation system which was not operable. Site personnel suggest that the bay is generally used for cold weather storage only.

The maintenance bay was found to contain custodial items, tools, waste motor oil, ladders and flammable storage cabinet. The flammable storage cabinet contained various paints and cleaning solvents.

PPE identified in the site included safety glasses and chemical gloves. Materials were kept in good, clean condition.

Ventilation System Assessment

The facility was found to boiler operated radiant heating and window unit air conditioners. A closed system boiler is located in the boiler room.

The LEV system located in the garage was not operable at the time of the assessment. The system consists of one main fan and three flex duct branches.

Additional Items

No O&M plan could be identified. Initiate an O&M Plan for the asbestos containing materials or presumed asbestos containing materials. Maintain a copy of the O&M Plan onsite at all times.

Conduct a cleaning of the kitchen and maintenance office for removal of surface lead.

Efflorescence was noted on the outdoor fuel tank, which is covered in a concrete material. The builder of the tank system suggests that the original waterproofing of top mounted piping and hardware should be reapplied as well as the full application of waterproofing agent.

Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicated within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and The El Group, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

References

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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

10

Appendix A

Photographs



Damaged ACM in basement hallway



Visible fungal growth on wall of B03





Exterior View of facility



Efflorescence on rear fuel storage tank





LEV fan in maintenance bay



Typical water damage of ceiling materials on second floor





Released by National Guard Bureau Page 2715 of 5269



FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2716 of 5269



Posted to NGB FOIA Reading Room May, 2018

Released by National Guard Bureau Page 2717 of 5269

Appendix B

Laboratory Analysis Report





AMA Analytical Services, Inc.



				Invoice:	95263
Client:	National Guard Bureau	Job Name:	RC #495: Elkton, MD	Chain Of Custody:	181430
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI	Job Location:	Not Provided	Date Submitted:	10/1/2008
	State Military Reservation	Job Number:	Not Provided	Date Analyzed:	10/8/2008
	Havre de Grace, Maryland	P.O. Number:	Not Provided	Date Invoiced:	10/8/2008
	21078			Person Submitting:	Non-Responsive

Attention:

Page 1 of 2

AMA Sample #	Client Sample #	Analysis and Sample Type	Turn Around	Cost	Additional Analysis and Sample Type *	Turn Around *	Additional Cost *	Total Cost
								** **
0882197	495-1	AA Lead Air	5 Day +	\$8.00				\$8.00
0882198	495-5	AA Lead Air	5 Day +	\$8.00				\$8.00
0882199	495-3	AA Lead Air	5 Day +	\$8.00				\$8.00
0882200	495-L-4	AA Lead Paint	5 Day +	\$9.00				\$9.00
0882201	495-L-6	AA Lead Paint	5 Day +	\$9.00				\$9.00
0882202	495-L-7	AA Lead Paint	5 Day +	\$9.00				\$9.00
0882203	495-L-10	AA Lead Paint	5 Day +	\$9.00				\$9.00
0882204	495-L-11	AA Lead Paint	5 Day +	\$9.00				\$9.00
0882205	495-L-1	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882206	495-L-2	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882207	495-L-3	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882208	495-L-5	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882209	495-L-8	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882210	495-L-9	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882211	495-L-12	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882212	M-495-3	MLD Spore Trap	5 Day +	\$30.00				\$30.00
0882213	M-495-4	MLD Spore Trap	5 Day +	\$30.00				\$30.00
0882214	M-495-5	MLD Spore Trap	5 Day +	\$30.00				\$30.00
0882215	M-495-6	MLD Spore Trap	5 Day +	\$30.00				\$30.00
0882216	495-3A	MLD Surface Tape	5 Day +	\$21.00				\$21.00
0882195	495-4	PCM Air	5 Day +	\$10.00				\$10.00
0882196	495-2	PCM Air	5 Day +	\$10.00				\$10.00

Note: Payment Due Upon Receipt.

May, 2018

Note: All Accounts over 30 days are subject to a 11/2% per month service charge.

* Only apply if additional analysis was performed on the sample(s)

NATLG Account Code:

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Remit to: P.O. Box 646, Hanover, Maryland 21076, 410-684-3327 BEST AVAILABLE COPY FOIA Requested Posted to NGB FOIA Reading Room

FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2719 of 5269

函		AMA	Analytical Services, Inc.					K	
						Invoid	e:	95263	
Client:	National Gu	lard Bureau	Job Name:	RC #495: El	kton, MD	Chain Of Cus	lody: 1814	130	
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI		Job Location:	Not Provided		Date Submitted:		10/1/2008	
	State Militar	ry Reservation	Job Number:	Not Provided	i	Date Analyze	d: 10/8	/2008	
	Havre de G	race, Maryland	P.O. Number:	Not Provided	1	Date Invoiced	: 10/8/	/2008	
	21078					Person Subm	itting:	Responsive	
Attention:	Non-Respor	nsive						Page 2 of 2	
AMA Sample #	Client Sample #	Analysis and Sample Type	Turn Around	Cost	Additional Analy and Sample Typ	sis Turn æ* Around	Additional * Cost *	Total Cost	

Sub-Total:	\$286.00
Additional Charge:	\$0.00
Total:	\$286.00

Note: Payment Due Upon Receipt.

Note: All Accounts over 30 days are subject to a 11/2% per month service charge.

* Only apply if additional analysis was performed on the sample(s)

Account Code: NATLG

-

Remit to: P.O. Box 646, Hanover, Maryland 21076, 410-684-3327

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FOIA Requested Records

May, 2018
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National Guard Bureau Job Name: RC #495: Elkon. MD G 301-HE Old Bay Lane, Attn: NGB-AVN-SI, State Milliary, Reservation Job Location: Not Provided p Havre de Grace, Maryhand 21078 Job Number: Net Provided p P.O. Number: Net Provided p p Client Sample Analysis Type Sample Type Air Volume Area Wiped p 495-1 Flane Air Oll NA 2.13 n 495-1 Flane Air Oll NA 2.13 n 495-1 Flane Air Diant Chip ii H410 NA 2.13 n 495-1.7 Flane Paint Chip erea NA 2.13 n 495-1.71 Flane Paint Chip erea NA 2.13 n 495-1.71 Flane Paint Chip erea NA 0.01 30.01 495-1.8	0882211		0882210	0882209	0882208	0882207	0882206	0882205	0882204	B 0882203	ST 0882202	AV 0882201	0882200	BL 0882199	E 0882198	OPY 0882197	AMA Sample Number	•	Attention:			Address:	Client	E
a Job Name: RC #495: Elkton, MD Cf Atm: NGB-AVN-SI, too Job Location: Not Provided pa and 21078 Job Location: Not Provided pa Analysis Type Job Number: Not Provided pa Flame Air Air H10 Area Wiped pa Flame Air Bank 0 N/A 2.13 t Flame Air Bank 0 N/A 2.13 t t Flame Air Blank 0 N/A 2.13 t t t Flame Paint Chip **** N/A 2.13 t t Flame Paint Chip **** N/A 0.01 t		495-L-12	495-L-9	495-L-8	495-L-5	495-L-3	495-L-2	495-L-1	495-L-11	495-L-10	495-L-7	495-L-6	495-L-4	495-3	495-5	495-1	Client Sample Number		Non-Re6		Havre de Grace, Mary	301-IH Old Bay Lane, State Military Reserva	National Guard Burea	
Job Name:RC #495: Elkton, MDCPJob Location:Not ProvidedProvidedProvidedJob Number:Not ProvidedProvidedProvidedPO. Number:Not ProvidedArra WipedProvidedSample TypeAir VolumeArra WipedReportAirH10N/A2.13LimitAirBlank0N/A2.13LimitPaint Chip***N/A0.019Paint Chip***N/A0.019Paint Chip***N/A0.019Paint Chip***N/A0.019Paint Chip***N/A0.019Paint Chip***N/A0.108111.521Wipe****0.108111.521Wipe****0.108111.521Wipe****0.108111.521Wipe****0.108111.521Wipe****0.108111.521Wipe****0.108111.521Wipe****0.108111.521Wipe****0.108111.521Wipe****0.108111.521Wipe****0.108111.521Wipe****0.108111.521Wipe****0.108111.521Wipe****0.108111.521Wipe****0.10811		Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Analysis Type				land 21078	Attn: NGB-AVN-SI, tion	-	
RC #495: Elkton, MD Cl Not Provided D Not Provided Pe Not Provided Pe Not Provided Pe Air Volume Area Wiped Reportin 1410 N/A 2.13 0 N/A 3.00 U 1343 N/A 2.23 U N/A 0.01 9 U N/A 0.01 9 U N/A 0.01 9 U N/A 0.108 111.52 U N/A 12.00 U U		Wipe Blank	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Paint Chip	Paint Chip	Paint Chip	Paint Chip	Paint Chip	Air	Air Blank	Air	Sample Type	Summary		P.O. Number:	Job Number:	Job Location:	Job Name:	
on, MD Cl box MD Cl $Dr Dr Dr Dr Dr Dr Dr Dr Dr Dr $		****	****		****	***	****	****	****	***		••••	***	1343	0	1410	Air Volume (L)	of Atomic A		Not Provided	Not Provided	Not Provided	RC #495: Elkt	
Ci Da Pe Da Pe Da Pe Da Pe Da Pe Da Pe Da Da Da Da Da Da Da Da Da Da Da Da Da		Ν/Α	0.108	0.108	0.108	0.108	0.108	0.108	N/N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Area Wiped (ft²)	bsorption					on, MD	
		12.00 u	111.52 u	111.52 u	111.52 u	111.52 0	111.52 u	П11.52 и	0.01 9	0.01 9	0.01 9	0.01 9	0.01 9	2.23 u	3.00 u	2.13 u	Reporti Limi	Analysis		Ð	P	Ā	C	
"		12 սջ	110 ug/ft	110 սք/ք	3200 ug/ft	470 ug/ft	130 ug/ft	110 ug/ft	4.5 %Pb	0.098 %Pb	().19 %Pb	().97 %Pb	0.11 %₽b	2.2 ug/m	3 ug	2.1 ug/m	Final Result			9/9/2008	Non-Re	9/7/2008	181430	
181430 9/7/2008 9/7/2008 9/9/2008 9/9/2008 9/9/2008 2.1 ug/m 0.11 ug/m 0.14 %Pb 0.19 %Pb 110 ug/ft 110 ug/ft 110 ug/ft 110 ug/ft 110 ug/ft 110 ug/ft			N	L,	ы	ы	N	2						6		پ	Con			Report Date:				
181430 9/7/2008 9/9/2008 Report Date: 9/9/2008 Report Date: 9/9/2008 Report Date: 2.1 ug/m ³ 2.1 ug/m ³ 0.11 %Pb 0.19 %Pb 0.19 %Pb 0.19 %Pb 110 ug/ft ² 130 ug/ft ² 110 ug/ft ² 110 ug/ft ² 110 ug/ft ² 110 ug/ft ² 110 ug/ft ² 110 ug/ft ² 110 ug/ft ²	3 FOIA R	eadi	ng l	Roo	om					BE	ST	AV/	AILA	BL	EC	OPY	nments	Puge 1 of 2 R	eques	9/9/2008 ted F	Reco			Environmental Lease Tor device 85 Marcel

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCREDITED LA

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 natural protection to clients, the public, and these Laboratories, this report protection to clients, the public, and these Laboratories, this report to the information provided by the persons submitting them and, unless collected by personal of these Laboratories, this report to transmission deterror microscopy of AllERA at samples. This report must not be used to chim, and does not imply product certification, approval, or endorsement by WLAP, NIST, or any agency of the Federal Covernment. All rights reserved. AMA Analytical Services, Inc.

An AllHA (#100470), NVLAP (101143-0), and NV F1 AP AMA.

	%Pb = percent le Note: All samples Note: All resutts t should not be con Air and Wipe resi	Analysis Method Analysis Method N/A = Not Applic	AMA Sample Number	Attention:			Address:	Client:	A Spee	MA And
	ad by weight ug = ; were received in goo ; were two significant di nsidered when interpre nsidered when interpre	for Flame: Air, Wipes, For Furnace: Air, Wip able mg/Kg = pa	Client Sample Number	Non-Help		Havre de Grace, Mar	301-IH Old Bay Land State Military Reserv	National Guard Bure	cialized Environm	slytical Se
	 micrograms us of condition unless of gits. Any additional d sting the result. for any blank results 	, Paints, and Soil/Sol bes, Paints, and Soil/S ints per million (ppm) I	Analysis Type			yland 21078	e, Attn: NGB-AVN-SI, ration	21	ental Laboratory	ervices, In
	g/L = parts per oillion herwise noted. ligits shown	ids: EPA 600/R-93/20 Solids : EPA 600/R-93/20 by weight mg/L = p	Sample Type	Summary	P.O. Number:	Job Number:	Job Location:	Job Name:	C	?
Analy	(odd)	00(M)-7420; Water: 93/200(M)-7421; Wats per million (ppr	Air Volume (L)	of Atomic A	Not Provided	Not Provided	Not Provided	RC #495: Elkto	ERTIFICA	
st: Mélissa Sampso		SM-3111B aler: SM-3113B n)	Area Wiped (ff ²)	bsorption A				n, MD	TE OF AN	
3n // Technic	P	See QC Summary for analyti associated with these sampe NY ELAP accrediation applie samples.	Reporting Limit	Analysis for Lead	Date Analyzed:	Person Submitting:	Date Submitted:	Chain Of Custody:	ALYSIS	
al Manager: G	(al results of quali s s only to paint chi	final Result		9/9/2008	Non-Rec	9/7/2008	181430		
Edward Carney	And Contraction	ity control samples p, wipe, and water	Comme		Report Date: 9,		2	Ę	AC	CRA
	n.		nts	Page 2 of 2	/9/2008					Solution Car
	DEST AVAILA	ADLE COPY	F	OIA Reques Release	ted F ed by	Reco Nat	rd #J=1 ional G	9-0085 (uard Bu	(MQ) AN	OL /

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Page 2722 of 5269



AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 16553

	Analysis	Туре:	Flame		
	Sample 1	l yne	Air		
	Analysis	Date:	9/9/2008		
	Re	รนไป	Percent Recovery	RPD	Comment
Preparation Blank	-0.021	թթու			Acceptable
Report Limit Verification Sample	0.2096	ppm	83 R°%		Acceptable
Expected Spike Level (ppm) 0.25					
Duplicate Sample 1	•Num!	mg/Kg			
Duplicate Sample 2	ØNum!	mg/Kg		*Error	#Error
Matrix Spike Analysis					
Spiked Sample			104 24%		Acceptable
Spike Duplicate			04 69%a	0.43%	Acceptable
Laboratory Control Sample 1	133.054	H6	103.51%		Acceptable
Laboratory Control Sample 2	126 233	HE	103.92%	0.19%	Acceptable

Calibration Information

Correlation of Calibration Curve

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample	Delivery Group (SDG)
---------------------------------	----------------------

Chain Of Custo	dy AMA Sample Number	Client Sample Number
181397	81892	486-!
181397	81900	486-2
SDG Number:	16553	

0.909875

Page 1 of 2

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181397	81901	486-3
181401	82176	5-1
181401	82177	5-2
181401	82178	5-3
181401	82179	5-4
1#1430	82197	495-1
181430	82198	495-5
181430	82199	495-3
182583	82391	LCX:+104
182583	82392	LOC-105
182583	82393	LOC-106
182583	82394	LOC-107
182583	82395	1 OC-108
182583	82396	LOC-109

SDG Number: 16553

Page 2 of 2

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AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 16552

	Analysis I	fype:	Flame		
	Sample Ty	pe:	Paint Chip		
	Analysis I	Date:	9/8/2008		
	Res	ult	Percent Recovery	RPD	Comment
Preparation Black	-0.031	ppm			Acceptable
Report Limit Verification Sample	0 3418	pp m	102.6%		Acceptable
Expected Spille Level (ppm) 0.3333					
Duplicate Sample 1	9723	mg/Kg			
Duplicate Sample 2	8821	mg/Kg		9 73%	Acceptable
Matrix Spike Analysis					
Spiked Sample			92 45%		Acceptable
Spike Duplicate			94,00%a	1. 66° ∿	Acceptable
Laboratory Control Sample 1	\$28.377	₩Â	110.78%		Acceptable
Laboratory Control Sample 2	429.110	μg	94.52%	15.84%	Acceptable

Calibration Information

Correlation of Calibration Curve

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custo	dy AMA Sample Number	Client Sample Number
181397	81964	JR6-11
181397	\$1910	486-12
SDG Number:	16552	

0.000853

Page 1 of 2

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181397	81911	486-13
181397	81912	486-14
181430	82200	495-14
181430	82201	495-1-6
181430	82202	495-1-7
181430	R2203	495-1-10
181430	82204	495-1-11
181404	82235	487-7
181404	82236	487-9
181404	82237	487-10
181417	82254	CI
181417	82255	Ç2
176586	82328	CBC080908-10
176586	82329	CBC080908-11

SDG Number: 16552

Page 2 of 2

AMA Analytical Services, Inc.

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QC Summary

Sample Delivery Group: 16550

	Analysis	Туре:	Flame		
	Sample	Туре:	Wipe		
	Analysis	Detc:	9/9/2008		
	Re	esuit	Percent Recovery	rpd	Comment
Preparation Blank	-0.051	թրու			Acceptable
Report Limit Verification Sample	0.302	9pm	90.6%		Acceptable
Expected Spike Level (ppm) 0.3333					
Duplicate Sample I	#Num"	mg/Kg			
Duplicate Sample 2	#Num	mg/Kg		*Etror	#Error
Matrix Spike Analysis					
Spiked Sample			93.21%6		Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample 1	304.012	¥8	99.98°6		Acceptable
Laboratory Control Sample 2	291.358	48	100.69%	0.71**	Acceptable

Calibration Information

Correlation of Calabration Curve 0.999884

All calibration verification samples are within acceptance limits.

Notes:

Samples inclui	ded in this Sam	ple Delivery (Group (SDG)
----------------	-----------------	----------------	-------------

Chain Of Custo	ody - AMA Sample Number	Client Sample Number
181430	82205	495-11
181430	82206	495-1-2
SDG Number:	16550	

Page 1 of 2

Chain Of Custody	AMA Sample Number	Client Sample Number
181430	82207	495-1-3
181430	82206	495-1-5
181430	82209	495-L-8
181430	82210	495-L-9
181430	82211	495-L-12
181417	82248	WI
181417	82249	W2
181417	82250	W1
161417	82251	W4
181417	82252	W5
181417	82253	W6

SDG Number: 16550

Page 2 of 2

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CERTIFICATE OF ANALYSIS Spore Trap Analysis Report



Client:	National Guard	Bureau			lob Name:	RC #495: Elkton, MD	C	hain Of C	istody:	181430	
Address:	301-IH Old Bay State Military R	Lane, At eservation	tn: NGB-/ 1	AVN-SI,	lob Location:	Not Provided	Da	ate Submi	tted:	9/7/2008	I
	Havre de Grace,	, Marylan	1 21078		lob Number:	Not Provided	Pe	erson Subi	nitting:	Non-Resp	onsi
Attention:	Non-Responsiv	ve		1	P.O. Number:	Not Provided	Da	ate Analyz	æd:	9/9/2008	ł
							R	eport Date	:	9/10/200	8
AMA Sample	#		088221	2		AMA Sample #		088221	3		
Client ID			M-495	-3		Client ID		M-495-	4		
Analyst ID			TLX	v		Analyst ID		TLW	7		
Collection An	paratus		Allergenc	0		Collection Apparatus		Allergence	,		
Sample Volur	ne (L)		7	5		Sample Volume (L)		7	5		
Analytical Se	nsitivity (sp/m³)		5	5		Analytical Sensitivity (sp/m³)		55	;		
Sample Cond	ition		Acceptab	le		Sample Condition		Acceptabl	e		
		Row (°T	%	sn/m³			Raw CT.	%	sp/r	m³	
Alternaria			1	ч р		Alternaria			-		
Ascospores		2	5.0%	1	10	Ascospores	2	5.9%		110	
Aureobasidiu	m	_				Aureobasidium					
Basidiospores	 1	18	45.0%	9	91	Basidiospores	8	23.5%		441	
Bipolaris/Dre	chslera/Helm.					Bipolaris/Drechslera/Helm.	1	2.9%		55	
Boletus	-					Boletus					
Botrytis			•			Botrytis					
Cercospora		İ				Cercospora	5				
Chaetomium						Chaetomium					
Cladosporium	n	2	5.0%	1	10	Cladosporium	8	23.5%		441	
Coprinus						Coprinus		:			
Curvularia						Curvularia					
Epicoccum						Epicoccum					
Fusarium		. :	l			Fusarium					
Ganoderma						Ganoderma	. :				
Nigrospora		1				Nigrospora				1	
Penicillium /	Aspergillus	4	10.0%	2	20	Penicillium / Aspergillus	5	14.7%		275	
Pithomyces						Pithomyc es	Present	4	<	55	
Rusts						Rusts		المعيد ا			
Smuts/Perico	nia/Myxomycetes	2	5.0%	1	10	Smuts/Periconia/Myxomycetes	4	11.8%		220	
Stachybotrys		1				Stachybotrys		: I			
Stemphylium		i	•		i	Stemphylium		1			
Trichoderma			I I			Trichoderma		i İ			
Torula					:	Torula					
Ulocladium			! I					1			
Zygomycetes		1	10.00/	,	0	Zygomycetes	6	17.6%		330	
Other Colori	ess	12	30.0%	6	01	Unknown		1 1.070		550	
Unknown		1				Uurhal Fragmante*	 Present		<	55	
Hyphal Frag	ments*				l	Trichocladium	Present	i I	<	55	
					ļ	TILLUCIAMUM	1100011				
Totals Spore	Concentration		!	2,2	00	Totals Spore Concentration				1,870	
Location	B03		I			Location 103					
Comments						Comments					

An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

AMA Analytical Services, Inc. BEST AVAILABLE COPY



A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS



Spore Trap Analysis Report

Client:	National Guard	Bureau			Job Name:	RC #495: Elkton, MD	С	hain Of C	ustody:	181430
Address:	301-IH Old Bay State Military R	Lane, At eservation	tn: NGB-A	VN-SI,	Job Location:	Not Provided	D	ate Submi	tted:	9/7/2008
	Havre de Grace,	Maryland	d 21078		Job Number:	Not Provided	P	erson Subi	mitting:	Non-Respons
Attention:	Non-Responsive				P.O. Number:	Not Provided	D	ate Analyz	red:	9/9/2008
							R	eport Date	:	9/10/2008
			000771			AMA Sample #		088221	5	
AMA Sample	4		000221*	•				M-495-	6	
Client ID			M-490-3	, ,		A polyet ID		עוד	7	
Analyst ID			IL W	ſ		Collection Apparatus		Allergence	, D	
Collection App	aratus		Allergence	, F		Sample Volume (I.)		7	5	
Sample Volum	ie (L)			,		A nelutional Sensitivity (en/m ³)		54		
Analytical Sen	sitivity (sp/m [*])		33 4	_		Sample Condition		Accentabl	e	
Sample Condit	hon		Ассертави	e		Sample Condition		reception	·	
	1	Raw CT.	%	sp/m²	1		Raw CT.	%	sp/	'n°
Alternaria						Alternaria	2	0.7%		110
Ascospores		2	10.0%		110	Ascospores	63	21.6%		3,470
Aureobasidiur	n					Aureobasidium				
Basidiospores		3	15.0%		165	Basidiospores	46	15.8%		2,530
- Bipolaris/Drec	hslera/Helm.					Bipolaris/Drechslera/Helm.	Present		<	55
Boletus						Boletus		-		4
Botrytis						Botrytis				
Cercospora						Cercospora	Present		<	55
Chaetomium						Chaetomium				
Cladosporium		2	10.0%		110	Cladosporium	130	44.7%		7,160
Coprinus						Coprinus				
Curvularia						Curvularia	1	0.3%		55
Epicoccum		Present		<	55	Epicoccum	2	0.7%		110
Fosarium						Fusarium				
Ganoderma					i	Ganoderma				
Nigrospora						Nigrospora	Present	ľ	<	55
Penicillium / A	spergillus	2	10.0%		110	Penicillium / Aspergillus	17	5.8%		936
Pithomyces		Present		<	55	Pithomyces	Present		<	55
Rusts		1	5.0%		55	Rusts				
Smuts/Pericon	ia/Myxomycetes	2	10.0%		110	Smuts/Periconia/Myxomycetes	13	4.5%		716
Stachybotrys		I				Stachybotrys	i I			
Stemphylium		! .			•	Stemphylium				
Trichoderma						Trichoderma				
Torula						Torula	Present		<	55
Ulocladium						Ulocladium				
Zygomycetes						Zygomycetes				
Other Colorie	ss	8	40.0%		44]	Other Colorless	13	4.5%		716
Unknown						Unknown				
Hyphal Fragn	nents*					Hyphal Fragments*	. 1	!		55
						Peronospora/Oidium	3	1.0%		165
						Pyricularia	1	0.3%		55
Totals Spore (Concentration			1	,100	Totals Spore Concentration				16,000
Location	207					Location Out				
Comments						Comments				

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS



Spore Trap Analysis Report

Client:	National Guard Bureau	Job Name:	RC #495: Elkton, MD	Chain Of Custody:	181430
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Not Provided	Date Submitted:	9/7/2008
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	Non-Responsive
Attention:	Non-Responsive	P.O. Number:	Not Provided	Date Analyzed:	9/9/2008
				Report Date:	9/10/2008

General Comments, Disclaimers, and Footnotes

Analytical Method:	Sample are analyzed following the instructions and guidelines outlined in AMA Analytical Services, Inc. SOP 901.
Sample Condition:	Acceptable: The sample was collected and delivered to the our location without disturbing the material on the sampling media.
	Unacceptable: 1. The sample is overloaded with material. 2. The sample trace has been disturbed. 3. The sample was not collected properly.
	Obscured: The loading on the sample is high, possibly obscuring spores present. The quantity reported should be considered the minimum concentration present. The actual concentration may be higher than the reported concentration.
Spore Notes:	Based on their small size and very few distinguishing characteristics, Aspergillus and Penicillium cannot be differentiated by non-viable sampling methods. There are other types of spores whose morphology is similar to Aspergillus and Penicillium and cannot be differentiated by non-viable sampling methods. Examples of these similar spores are Acremonium, Paecilomyces, Wallemia, and Trichoderma.
	Smut, Periconia and Myxomycetes are three different types of organisms that have similar morphological characteristics.
	Bipolaris/Dreschlera/Helm: Bipolaris / Dreschlera / Helminthosporium group.
	Other Colorless represents all colorless spores that are non-distinctive and unidentifiable.
*	Hyphal Fragments: A portion of the mycelium that becomes separated from the remainder of the thallus (vegetative body), each of which has the capacity to grow and form new individuals. Results for hyphal fragments are in fragments/m ³ and are not incorporated in the total spore concentration.
Quantification:	Analytical Sensitivity (A.S.): This is dependent on the volume of air collected and the amount of the trace that was analyzed.
	The value of "Present" indicated in the Raw Count column represents the presence of this spore type during the preliminary exam at 400x. The Raw Count converts to a whole number if the spore type is encountered again during the 1,000x enumeration. The sp/m ³ concentration will be reported as less than the analytical sensitivity if "Present" is reported in the Raw Count.
	Due to rounding, totals may not equal 100%
	sp/m ³ : Spores per cubic meter.
	Results are reported to 3 significant figures.

Tristan Ward Analyst

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.

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Page 3 of 3

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CERTIFICATE OF ANALYSIS

Quantitative Spore Analysis Report

Client:	National Guard Bureau	Job Name:	RC #495: Elkton, MD	Chain Of Custody:	181430
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SL State Military Reservation	Job Location:	Not Provided	Date Submitted:	9/7/2008
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	Non-Responsive
Attention:	Non-Responsive	P.O. Number:	Not Provided	Date Analyzed:	9/9/2008
				Report Date:	9/10/2008

AMA Sample #		0882216
Client ID		495-3A
Analyst ID		TLW
Sample Type		Tape
Sample Condition		Acceptable
Analytical Sensitivity		1080 sp/in²
	sp/in²	Loading
Alternaria	-	
Ascospores		
Aureobasidium	9,720	Few
Basidiospores	, ,	
Bin/Dresch/Helm		
Boletus		
Botrytis		I .
Cercospora		
Chaetomium		
Cladosporium	81,000	Moderate
Coprinus		
Curvularia		
Epicoccum		
Fusarium		
Ganoderma		
Nigrospora		
Pen/Asp Like		
Pithomyces		
Rusts		
Smuts/Peri/Myx		
Stachybotrys		
Stemphylium		i
Trichoderma		
Torula		
Clocladium		
Zygomycetes		
Other Colorless		
Hyphal Fragments	11,900	Few
Unknown		

Location B03 Comments

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CERTIFICATE OF ANALYSIS Quantitative Spore Analysis Report

Client:	National Guard Bureau	Job Name:	RC #495: Elkton, MD	Chain Of Custody:	181430
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Not Provided	Date Submitted:	9/7/2008
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	Non-Responsive
Attention:	Non-Responsive	P.O. Number:	Not Provided	Date Analyzed:	9/9/2008
				Report Date:	9/10/2008

General Comments, Disclaimers, and Footnotes

Sample Condition:	Acceptable: The sample was collected and delivered to the our location without disturbing the material on the sampling media.
	Unacceptable: 1. The sample is overloaded with material. 2. The sample was not collected properly.
	Obscured: The loading on the sample is high, possibly obscuring spores present. The quantity reported should be considered the minimum concentration present. The actual concentration may be higher than the reported concentration.
Spore Notes:	Pen/Asp: Penicillium / Aspergillius. Based on their small size and very few distinguishing characteristics, Aspergillus and Penicillium cannot be differentiated by non-viable sampling methods. There are other types of spores whose morphology is similar to Aspergillus and Penicillium and cannot be differentiated by non-viable sampling methods. Examples of these similar spores are Acremonium, Paecilomyces, Wallemia, and Trichoderma.
	Smuts/Peri/Myx: Smut, Periconia and Myxomycetes are three different types of organisms that have similar morphological characteristics.
	Bip/Dresch/Helm: Bipolaris / Dreschlera / Helminthosporium group.
	Other Colorless represents all colorless spores that are non-distinctive and unidentifiable.
	Hyphal Fragments: A portion of the mycelium that becomes separated from the remainder of the thallus (vegetative body), each of which has the capacity to grow and form new individuals.
Quantification:	Rare: <1,600 sp/in², Few: 1,600 to 16,000 sp/in², Moderate: >16,000 to 160,000 sp/in², Heavy: >160,000 sp/in².
	Analytical Sensitivity: Represents the value of one spore divided by the area analyzed.
	sp/in ² : Spores per inch squared.
	Results are reported to 3 significant figures.

Irista Nat

Analyst Tristan Ward

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.

AMA Analytical Services, Inc.

COPY								R	2	AN
0882195	VMA Sample Number		Attention:			Address:	Client:	L	AS	NA AI
495-4	Client Sample Number		Non-Respt		Havre de Grace, Marylan	301-TH Old Bay Lane, At State Military Reservation	National Guard Bureau		pecialized Environment	naiytical ser
0	Volume Sample (Liters)				d 21078	tn; NGB-AVN-SI, n			al Laboratory	vices, Inc.
^	- E A S	Summa		P.O. Number:	Job Number:	Job Location:	Job Name:		CI	•
7.0 *	bers Per illimeter iquared	ry of Phase		Not Provided	Not Provided	Not Provided	RC #495: Elktor		ERTIFICA	
****	Fibers Per Cubic Centimeter	Contrast Mic					n, MD		TE OF ANALY	
С,	Analyst I.D.	roscopy		Date Analyzed	Person Submit	Date Submitte	Chain Of Cust		YSIS	
N/P	Sample Type			k: 9/9/2008	tting: Nortes	d: 9/7/2008	ody: 181430			
	Comment			Report Date:		_				
COPY	56 ;	Page 1 of 1		9/10/2008	10920	NY ELA	100470	Industrial Hygione See analyse or	ACA	SDITED LABO
5511	- FU	Re	lease	d by	Natio	onal Gu Page 2	ard B 734 of	ureau 5269	YRO	

'Fibers' (Revision 3, Issue 2, 8/15/94). All personnel samples were analyzed following the OSHA Reference Method * The Reporting Limit for AMA Laboratory is 7.0 fibers per square millimeter of filter. The reporting limit for the air concentration of fibers (*l*/cc) is dependent on the sampled air volume. Fibers counts were determined by the methods described in NIOSH Analytical Method 7400

Uncertainty: for fibers/mm² in the range of 7-25 the CV is 0.305, 26-64 CV=0.264, 64-127 CV=0.302, >127 CV=0.344 Sample results shown here have been corrected for any field blank(s) submitted with this sample set Note: All samples were received in good condition unless otherwise noted

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495-2

1049.43

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SAMPLE CHAIN OF	CUSTOD	Y	181430
DATE SHIPPED # OF SAMP	ries -2	SAMPLE MEDIA	TYPE PROJECT NAME Elkton: MD NG-
Non-Responsive	SAMPLE	BAMPLE	
SAMPLE # OR AREA	DATE	VOLUME	ANALYSIS REQUESTED
495-1	8/1/08 .	1409.88	Ain: Lest
445-7-5		0	
445-3		1342.59	V
495-4		0	Air: Asis
495-2		1049.43	V
M-495-3 (803)		750 L	Ain: Fungal Spore
M-495-4 (103)			
m - 495-5 (207)			
M-495-6 (aut)			V
495-3A (803)			Surface: Formand spore
495- 6-4 (801)			Log 6: Chips
495-6-6 (01)			
445-L-7 (102)			· · · · · · · · · · · · · · · · · · ·
445-L-10 (205A)			
445-L - 11 (203A)	$ $ \forall		↓·
Samples Relinquished By	/: Signaturi	the	5/17/08 Date
Samples Received By:	Signatur	2) Date
Samples Analyzed By:	Signature	3	Date

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2735 of 5269

SAMPLE CHAIN OF	CUSTOD	Y		N
DATE SHIPPED # OF SAMP	LES	SAMPLE MEDIA	TYPE PROJECT NAME	()
Non-Responsive		O ANDI E		
SAMPLE # OR AREA	DATE	VOLUME	ANALYSIS REQUESTED	
495-6-1 (B-11 R)	B/7/00	100 cm	Lad: wife	-
445 - L-2 (B-08V)				
495-L-3 (BOI)				
445-L-5 (BOY K)				
445-2-8 (107)				
445-6-9 (2030)				
495-L-12 (Black)	V	V	V .	
	: <u> </u>		M. 8987	
			annan Baylar - Gryn ann dialainni ar ann an an ann an ann an ann an ann an	
		a de Maria a manacima da de Maria de La como de Maria de	· · · · · · · · · · · · · · · · · · ·	
		1	a an an an an an an an an an an an an an	
Samples Relinquished By	: Signature	NI -	12/ 2	3
Samples Received By:	Signature	V	Date	
Samples Analyzed By:	Signature		Date	

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Posted to NGB FOIA Reading Room May, 2018

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2736 of 5269

AMA Analytica Focused on Results	Services, Inc.			(Plance Rafer To This A C A I C A	
AIHA (#100470) NVL 4475 Forbes Blvd La (301) 459-2640 - (800	AP (#101143-0) NY ELAP (anham, MD 20706) 346-0961 • Fax (301) 459-2	643	CHAIN OF CUSTODY	Number For Inquires) LOL4JU	5 (MD)
Mailing/Billing Information	honel (trank Bu	New NE	Submittal Information: # 49	S: Elthon, MD	15,008
2 Address 1: <u>SO</u> 3. Address 2: Ho	ve de Gree, M	Lane ZI	2. Job Location: 3. Job #	P.O. #.	ard #1
4. Address 3: 5. Phone # 336 48	2558 Fax #	704 543	4. Contact Person: 1650 5. Submitted by	Signature:	d Rec
		Reporting Infor	rmation (Results will be provided as soon as technic	diy feasible):	ester
AFTER HOURS (must be Timmediate Date Date:	jor-scheduled)	Immediate	U 3 Day	Includ Includ A Sheets with Report	Deque
D 24 Hours The Due		Next Day	AS Day + We (Every Annung Will Be Date True) - We (Every Annung Will Be	an African D Par	
				O Verbals	FC
Asbestos Analysis PCM Air - Please Indicate Filte	r Type:	a C Ne Mel	alk 3LAP 198.4(Charliek)(QTY)	Lead Analysis APaint Chip 5 (OTY)	
PC MCE Porosity	n a 25mm 37mm (QTY)	00	VY State PLM/TEM (QTY) Residual Add (QTY)	A Dust Wing (wine type) 7 (01)	5 (
J Fiberglass	_(QTX) _Type: 	TEMD	und Qual. (pros/abs) VacuumvDus:(QTY)	C Soil/Soil/ (QTY)	COP
D AHERA	(QTY)		Quan (starca) vacuum D57755757575757575757575757575757575757	C Demking Water (QTY)	ABLE
D Other (specify	(QTY)		auri Qual. (pres/abs) (QTY)	-1 ionsi wije journace (wije iype)	 2 3 /AIL/
 EPA 600 - Visual Estimu EPA Point Count 	(QTY)		EPA 100.1 (QTY)	Mold - Direct Microscopic Analysis	
C NY Sonz Friable 198.1 Grav. Reduction ELAP	(QTY) 0.86		All samples received in good condition unless otherwise need.	Spore-Trap (QTY) D Bulk (QTY) Surface Swab (QTY)D Surface Vacuum Dust	IQTY) BES
U Dubçı (specity	MPLE INFORMATION	ſ	ANALYSIS	X	
CLIENT D SY	DENTIFICATION DATE O	UTERSI AREA	TEM PLM PLM AND ALR BULL	PE A S (LABORATORY STAFF ONLY)	
				Date/Time: Contact: B	3y:
					Room
A	2+++1	CALC		Date/Time: Contact: B	adin/
	000				Rea
	Z peges				FOIA
				Date Time: Contact R	
					I
		¢		A CAR WARN AND	Po
LABORATORY	1. Date/Time RCVD:		VV @UVV Viz: V T > By (Princ) A	A Samuely and Signi / Vet 7	
STAFF ONLY:	2, Uais/ main Analyzou:		Way Way		
(CUSTORY)	4. Comments:				

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2737 of 5269

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Industrial Hygiene Survey

National Guard Facility Elkton Armory 101 Railroad Avenue Elkton, MD 21921-5535

Prepared For:	National Guard Bureau Region North IH 301-JH Old Bay Lane
	Havre de Grace, MD 21078
Survey Location:	Elkton Armory
	101 Railroad Avenue
	Elkton, MD 21921
Prepared By:	Analytical Laboratory Services, Inc.
	3544 North Progress Avenue
	Suite 100
	Harrisburg, PA 17110
Survey Date:	July 16, 2010
Report Date:	August 23, 2010
ALSI Project #:	1007445
Non-Responsive	

Director, Environmental Health & Safety

Table of Contents
Section 1.0 Executive Summary
Section 2.0 Operation Description & Observations
Section 3.0 Noise Survey
Section 4.0 Lead Testing
Section 5.0 Lighting
Section 6.0 Indoor Air Quality
Section 7.0 Suspect Asbestos Containing Building Materials
Section 8.0 Maintenance Bay
Section 9.0 Limitations
Appendix A. Laboratory Analysis Report
Appendix B. Photographs
Appendix C. Floor Plan
Appendix D. References

Section 1.0 Executive Summary

Section 1.0 Executive Summary

An industrial hygiene survey was conducted July 16, 2010, at the Elkton Armory located at 101 Railroad Avenue, Elkton, Maryland 21921. The survey was performed by Ms.

- 1. Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft² in attached garage on top of the locker. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft².
- 2. Employees were not performing tasks that provided excessive noise levels. Therefore, noise exposure monitoring was not conducted.
- 3. Lighting levels met the minimum recommended guidelines in all but the following areas: 1) Room 103, 2) Room B04 3) Room B03. 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% whenever possible.
- 5. A few water damaged ceilings or other areas were observed. All sources of water infiltration should be identified and repaired. Water damaged ceiling and building materials should be removed and replaced. Some water damaged building materials may contain asbestos and should be handled properly.

Section 2.0 Operation Description & Observations

Section 2.0 Operation Description & Observations

The Elkton Armory serves primarily as an office setting and equipment storage facility. The facility consists of offices, a drill hall, garage, and storage areas. There are eight full-time employees stationed at the facility. On drill weekends there can be many more occupants.

The building was initially constructed in 1915. There is a garage attached to the Armory. The exterior of the building is stone or 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. 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. The Drill Hall has a wooden floor. Some areas were finished with vinyl floor tiles or other flooring on top of the concrete. The ceilings were generally composed of a roof deck. Some areas were finished with a suspended drop ceiling system.

There is an old firing range in the building. It is closed and has been fully abated. It is used for storage and as a locker room.

Site personnel at the time of the site assessment consisted of four administrative personnel and four maintenance 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. Many areas have lap top computers. Work stations appeared properly designed. Personnel had supportive chairs.

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Section 3.0 Noise Survey

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2744 of 5269

Section 3.0 Noise Survey	·	·	
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Employees were not performing tasks that provided excessive noise levels. Therefore noise exposure monitoring was not conducted.

Section 4.0 Lead Testing

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Section	4,0	Lead	Testing	
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At the time of the assessment, no activities were observed which would generate lead exposure. Soldiers reportedly clean tifles sometimes during drill weekends. The facility contains a room which was once an indoor firing range. It has been abated and is now a locker room and storage area.

....

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected using Ghost WipeTM samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 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.

Sample #	Location	Air ug/m ³	Surface ug/ft ²	Paint Chip %Pb
]	Room B09	<3.5		
2	Room 102	<3.6	•	
3	Blank	<3 ug		
4	Converted Firing Range Room B11 Top of Desk		<110	
5	Converted Firing Range - Room B11 Top of Locker		-110	
6	Converted Firing Range – Room B11 Floor		<110	
7	Hallway Floor Outside of Converted Firing Range Room B11		<110	
8	Lounge Top of Bar	· · · <u> </u>	110	• •
9	Room B09 – Top of Typewriter Table		<110	
10	Kitchen Room B04 – Top of Table with Microwave		<110	1
I]	Attached Garage - Top of Locker		1,100	
12	Room 107 – Top of Bookshelf		<110	
13	Room 103 – Top of TV Shelf		<110	
14	Drill Hall Stepper		<110	
15	Drill Hall Floor by Flags		<110	
16	Drill Hall - Floor Behind Bicycle		<110	
17	Room 204 Top of Bookshelf on Center Wall		<110	ĺ
18	Blank		<12 µg	T
19	Boiler Room - Ceiling]	0.051
Criteria		51	200	0,5

Lead Testing Results Summary

Key: Bolded results exceed listed criteria

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Surface levels of lead exceeded 200 ug/ft^2 in the attached garage on top of the locker.

The National Guard Bureau currently utilizes 200 ug/ft² as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for Environmental Chemicals," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft² is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft² on floors and 250 ug/ft² on windowsills should be observed. There is no child care provided at this facility.

Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 ug/m³. In fact, no detectable level of lead was identified in the air sample collected.

Deteriorated paint was observed at various locations throughout the facility. Delaminated paint was mostly due to age along with prolonged exposure to elevated relative humidity levels. A paint chip sample was collected from the Boiler Room Ceiling. The result did not exceed the HUD definition of lead-based paint (0.5%).

Housekeeping and cleaning activities should be improved to maintain surface lead dust concentrations below 200 ug/ft^2 . Deteriorated and peeling paint should be properly remediated and repaired.

Section 5.0 Lighting

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Section	5.0	Ligh	ting

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 ANSL/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Location	Measured Lighting (Foot Candles)	Recommended Lighting (Foot Candles)	Sufficient Lighting
Attached Garage	99.6	75	Yes
Drill Hall	81.3	30-50	Yes
Room 207	46.7	30-50	Yes
Room 205	45.5	30-50	Yes
Room 204	29.0	30-50	No
Room 203	46.7	30-50	Yes
Room 102	34.0	30-50	Yes
Room 107	32.1	30-50	Ycs
Room 103	15.3	30-50	No
B09	79.2	30-50	Yes
B09 Supply Room	102.0	30-50	Yes
B11	76.5	30-50	Yes
Lounge/Conference Room	42.6	30-50	Yes
B04	27.3	30-50	No
B03	28.5	30-50	No

Light Survey Assessment Summary

Lighting levels met the minimum recommended guidelines in all but the following areas: 1) Room 103, 2) Room B04 3) Room B03. Lighting should be improved in these areas.

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Section 6.0 Indoor Air Quality

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2751 of 5269

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 instrument was factory calibrated in March 2010.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASURAE) 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 71.2 to 89 degrees F with relative humidity readings ranging from 41.8% to 76.4%. During the survey, carbon dioxide (CO₂) levels ranged from 415 ppm to 831 ppm within the facility compared to an average outdoor CO₂ level of 429 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,129 ppm (429 ppm) 4 700 ppm). The following table summarizes the measurements collected.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	88.9	68.7	410	0.1
Attached Garage	89.0	67,5	415	0.3
Drill Hall	86.9	55.1	557	0.3
Room 207	87.9	54.2	582	0.3
Room 205	88.0	55,0	527	0.2
Room 204	88.0	56.1	555	1 0.0
Room 203	88.2	54.8	587	0.2
Room 102	85.7	41.8	657	0.1
Room 107	79.0	44.5	636	0.3
Room 103	76,4	36.8	505	0.1
B09	74.9	50. i	816	0.0
B09 Supply Room	74.7	53.1	831	0.0
	74.5	50.5	651	0.0
Lounge/Conference Room	71.2	51.6	621	0.0
804	74.2	75.0	556	0.0
B03	75,2	76.4	495	0.0
Outdoors	93,3	60,2	448	0.0
Criteria	73.0-79.0	30-60	<1,129	<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. A few areas have air conditioners. Outdoor conditions were hot and humid. Relative humidity should be maintained at 30-60%. Low relative humidity can lead to the drying of mucous tissues and an increased susceptibility to respiratory infection. High relative humidity can provide an environment suitable for microbial growth and proliferation. Carbon dioxide and carbon monoxide were within recommended guidelines.

A visual inspection was conducted throughout visually accessible portions of the facility. The visual inspection was conducted to assess sources or pathways of factors potentially deleterious to IAQ. The visual inspection revealed the following items that may be potential sources of poor IAQ:

- 1. Water damage was observed in the following locations:
 - o Drill Hall;
 - o Room 108;
 - o Room 205;
 - o Room 207;
 - o Room 203;
 - o Room B09;
 - o Lounge;
 - o Boiler Room.
- 2. Damaged ceiling appear to be from previous water leaks that have been repaired.
- 3. No areas of fungal growth were observed.

All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.

Section 7.0 Suspect Asbestos Containing Building 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 due to the age of the building. No samples were collected.

The following suspect ACM was noted at the time of this survey:

- 1. Approximately 500-1,000 ft^2 of 9" x 9" vinyl floor tile and mastic was observed in several locations throughout the building. In Room 102 some of the floor tiles have been removed leaving exposed mastic.
- 2. Pipe insulation and ceiling tile may also be asbestos containing materials.

Section 8.0 Maintenance Bay
Section 8.0 Maintenance Bay

There is a garage area attached to the Armory. Regular maintenance activities are no longer performed in this area. It is used primarily for storage and minor repairs as needed.

In the garage area there is an overhead vehicle exhaust system present. It was reported that this system is soldom, if ever, needed for the type of routine maintenance activity that is performed in the building. A ventilation survey of the current overhead vehicle exhaust system was performed by ALSI. Each drop consisted of a flex duet with a 5" duet diameter. The flow rate was measured and found to be 37.8 Cubic Feet per Minute (CFM) in Bay I and 23.66 in Bay 2. The actual flow rate that is required in a 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. We recommend that if vehicle maintenance is to be performed in this facility the overhead vehicle exhaust 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 (27^{th} Edition).

Section 9.0 Limitations

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Section 9.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Analytical Laboratory Services, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

Appendix A Laboratory Analysis Report

4475 Portes Blvd. Lanham, MD, 20706 (301) 459-2640 · Toll Pree (800) 346-0961 · Fax (301) 459-2643 An AIBA (F100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau-Page 2761 of 5269

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An AIHA (#100470), NVLAP (101143-0), and NV ELAP (#10920) Accredited Laboratory 4475 Forbes Blvd. • Lankam, MD, 20706 • (301) 459-2640 • Tall Pres (800) 346-0961 • Fax (301) 459-2643

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Appendix B Photographs

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Front of building



Autached garage, exhaust hese



Attached garage, exhaust pipes



Back of Drill Hall, water / paint damage



Back of Drill Hall, water / paint damage



Room 102 - remembry master from 9" x 9" MET



Respt 107 Geneticing V's 9" VET





Room 202 and 202, water duringed celling ides.

Room 205 / 203 hathroom - water damage - damaged paint on exilitings



Room 203 / 203 bathroom - water damage / damaged paint on coilings



Potential ACM - pipe insulation in Room B09 and hall outside B09



Old firing range, now locker room



Boiler room



Water damage i demorgial paint, back left communitation more



Water damage / damaged paint, back left corner of boiler room

Appendix C Floor Plans



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2778 of 5269



FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2779 of 5269

Appendix D References

Appendix D. References

- 1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead
- 2. American Conference of Governmental Industrial Hygienists (ACGIII) ---Threshold Limit Values and Biological Exposure Indices, 2010 Edition
- 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. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Thermal Environmental Conditions for Human Occupancy, 55-2004
- 6. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI
- 7. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI
- 8. National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.
- 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

17



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 Elkton Readiness Center

Prepared For:	National Guard Bureau Region North IH 301-IH Old Bay Lane
	Havre de Grace, MD 21078
Survey Location:	Elkton Readiness Center
	101 Railroad Avenue
	Elkton, MD 21921
Prepared By:	Compliance Management International, Inc.
	1215 Manor Drive
	Suite 205
	Mechanicsburg, PA 17055
Survey Date:	May 30, 2013

Report Date: June 24, 2013



Manager, Industrial Hygiene Services

Table of Contents

Section 1.0 Executive Summary
Section 2.0 Operation Description & Observations
Section 3.0 Lead Testing
Section 4.0 Lighting
Section 5.0 Indoor Air Quality
Section 6.0 Suspect Asbestos Containing Building Materials
Section 7.0 Equipment 11
Section 8.0 Limitations
Appendix A. Laboratory Analysis Report
Appendix B. Photographs
Appendix C. Floor Plan
Appendix D. References

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on May 30, 2013, at the Elkton Readiness Center located at 101 Railroad Avenue, Elkton, MD 21921. The survey was performed by Mr. Non-Responsive.

- 1. Lead surface and air samples were collected. Surface and air samples for lead were below recommended guidelines in all sampled locations. See Section 3.0 for detailed sampling results.
- 2. Lighting levels did not meet the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in one location. See Section 4.0 for detailed findings.
- 3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.
 - a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in all areas sampled.
 - b. The relative humidity levels met the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in all 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) in all areas sampled.
 - d. Carbon dioxide (CO₂) levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings in all indoor areas sampled.

See Section 5.0 for detailed sampling results.

- 4. Water-stained ceiling tiles were observed in some areas of the facility. See Section 5.0 for detailed findings.
- 5. All suspect asbestos containing materials (ACM) observed were found to be intact and in good condition except for in the basement bathroom where some fitting and insulation was in poor condition. See Section 6.0 for detailed findings.

Section 2.0 Operation Description & Observations

The Elkton Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, and a converted firing range area (currently wall locker storage). There were approximately 8 full-time employees stationed at this facility at the time of this survey.

The building was reported to have been built in 1935. It is a two-story structure with a basement. The exterior is constructed of stone and concrete. The interior walls are plaster, wood, and drywall in some of the offices. The floors are concrete, carpet, and tile.

The heating system consists of an oil-fired hot water generating unit. There is no central air-conditioning system. Some window units are present.

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 wall locker storage.

The drill hall ceiling has some isolated areas of peeling paint.

The facility has water stained ceiling tiles and efflorescence on the exterior walls on the 2^{nd} floor.

Housekeeping practices were good.

Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 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.

Sample #	Location	Air ug/m ³	Surface ug/ft ²
1	Drill Hall	<6.7	*
2	Converted Firing Range/Wall Locker Storage	<6.7	*
3	Drill Hall – Floor	*	<110
4	Drill Hall – Top of Computer	*	<110
5	Drill Hall – Top of Table	*	<110
6	Kitchen – Top of Refrigerator	*	<110
7	Kitchen – Top of Microwave	*	<110
0	Converted Firing Range/Wall locker Storage	*	<110
0	– Floor		
0	Converted Firing Range/Wall Locker Storage	*	<110
9	 Top of Wall Locker 		
10	Hallway Outside of Converted Range	*	<110
11	Basement Classroom – Top of Desk	*	<110
12	Supply Office – Top of Desk	*	<110
13	Recruiting Office – Top of File Cabinet	*	<110
14	1 st SG Office – Top of Safe	*	170
15	Commander Office – Top of File Cabinet	*	<110
16	2 nd Floor Classroom – Top of Table	*	<110
17	Blank Wipe	*	<12
18	Blank Air	<3	*
-	Criteria	50	200

Lead Testing Results Summary

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/ft² on floors and 250 ug/ft² on windowsills should be observed. There is no child care provided at this facility.

Lead surface and air samples were collected. The following is a summary of the sample results from this survey.

- Surface levels of lead were below the recommended guideline of 200 ug/ft² in all locations tested.
- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m³).
- Peeling paint was observed in the drill hall on the wooden ceiling. The ceiling
 was inaccessible therefore sampling was not performed. Approximately 100
 square feet of peeling paint was observed. The areas of peeling paint should be
 repaired.

Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 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.

Location	Foot Candles	Recommended	Sufficient
Location	(FC)	Lighting (FC)	Lighting
Drill Hall	55.8	10	Yes
Recruiting Office	38.1	30-50	Yes
TNCO Office	40.1	30-50	Yes
RNCO Office	34.8	30-50	Yes
1 st SG Office	30.6	30-50	Yes
Supply Office	55.3	30-50	Yes
Converted Firing			
Range/Locker Storage	73.3	10	Yes
Basement Classroom	55.8	50	Yes
Lounge	30.3	10	Yes
Kitchen	65.4	50	Yes
Locker Room	48.2	7	Yes
2 nd Floor Classroom	55.5	50	Yes
Commanders Office	26.1	30-50	No
2 nd Floor Locker Room	36.5	7	Yes

Light Survey Assessment Summary

Table Notes:

1. FC = Foot Candles

2. **Bolded** results did not meet listed criteria

Source: ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

The lighting level did not meet the minimum recommended guideline in the Commander's Office. Lighting should be improved in this area. All other areas met the minimum recommended guideline.

Section 5.0 Indoor Air Quality

Survey measurements were made for comfort parameters (temperature, relative humidity, carbon dioxide, and carbon monoxide). 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%.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Recruiting Office	78.6	56.1	684	0.0
Supply Office	77.2	58.6	575	0.0
Outdoors	92.1	41.0	368	0.0
Criteria	68-79	30-60	<1,068	<9

IAO Aggagger and Summary

The following table summarizes the measurements collected.

Table Notes:

- 1. **Bolded** results exceed listed criteria
- 2. **ppm** = parts per million
- 3. (%) = percent relative humidity
- 4. $^{\circ}\mathbf{F} = \text{degrees Fahrenheit}$

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements met the recommended guideline of 68-79°F in all sampled areas.
- Relative humidity levels met the recommended guideline of 30-60% in all sampled areas.
- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level for this

survey. Indoor carbon dioxide levels did not exceed the recommended ceiling of 1,068 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:
 - Water-stained ceiling tiles were observed in the facility.
 - \circ 2nd floor efflorescence was observed on the exterior walls
 - o A few were observed or reported throughout the facility

Section 6.0 Suspect Asbestos Containing Building Materials

The following suspect ACM was noted at the time of this survey:

- 1. The facility has green, red, and black 9" x 9" floor tiles in some areas of the building. The floor tile was intact and in good condition.
- 2. The basement bathroom has damaged mudded joint fitting and pipe insulation. A bulk sample was collected from the pipe insulation in the basement bathroom. The sampled contained 5% chrysotile asbestos. All damage pipe insulation and fittings in the bathroom should be professionally remediated.

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98011EL	11/2012	NA
SKC Air Sampling Pump	647598	5/30/13	2.5 LPM
SKC Air Sampling Pump	648349	5/30/13	2.5 LPM
Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

Appendix A. Laboratory Analysis Report

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS



Client: Address:		National Guard Bureau					ob Name:		Elkton-RC					Chai	Chain Of Custody: Date Analyzed:		27	
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Page 1 of 2

Client:	National Guard Bureau	Job Name:	Elkton-RC	Chain Of Custody:	516027		
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	Job Location:	Elkton, MD	Date Submitted:	6/3/2013		
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	Non-Responsive		
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	6/11/2013	Report Date:	6/11/2013
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Summary of Atomic Absorption Analysis for Lead

AMA Sample **Client Sample** Sample Type Air Volume Analysis Type Area Wiped Reporting Total ug **Final Result** Comments Number Number (L) (ft^2) Limit 13067201 450 1 Flame Air N/A <3 6.7 ug/m³ <6.7 ug/m³ 13067202 2 Flame Air 450 N/A <3 6.7 <6.7 ug/m³ ug/m3 3 **** 13067203 Flame Wipe 0.108 110 <12 ug/ft² <110 ug/ft² **** 13067204 4 Flame Wipe 0.108 110 <12 ug/ft² <110 ug/ft² 13067205 5 **** Flame Wipe 0.108 <12 ug/ft² ug/ft² 110 <110 13067206 6 **** Flame Wipe 0.108 <12 110 ug/ft2 <110 ug/ft² **** 13067207 7 Flame Wipe 0.108 110 <12 ug/ft' <110 ug/fl² **** 13067208 8 Flame Wipe 0.108 110 ug/fl² <12 ug/ft² <110 **** 9 13067209 Flame Wipe 0.108 110 <12 ug/ft² ug/ft² <110 13067210 10 **** Flame Wipe 0.108 <12 110 ug/ft2 <110ug/ft² **** 13067211 11 Flame Wipe 0.108 <12 110 ug/ft² <110 ug/ft² 12 **** 13067212 Flame Wipe 0.108 110 <12 ug/fl² <110 ug/fl2 13 **** 13067213 Flame Wipe 0.108 <12 110 ug/ft² <110 ug/ft² **** 13067214 14 Flame Wipe 0.10818 110 ug/ft² 170 ug/ft² 13067215 15 **** Flame Wipe 0.108 <12 110 <110 ug/ft² ug/fl² **** 13067216 16 Flame Wipe 0.108 <12 <110 110 ug/ft² ug/ft² 13067217 17 **** Flame Wipe Blank N/A 12 <12 ug ug 13067218 18 0 Flame Air Blank N/A 3 <3 ug/m³ ug

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LA9 #100470

Client:	National Guard Bureau	Job Name:	Elkton-RC	Chain Of Custody:	516027		
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	Job Location:	Elkton, MD	Date Submitted:	6/3/2013		
	Havre de Grace, Maryland 21078	Job Number: P.O. Number:	Not Provided W912K6-09-A-0003	Person Submitting: Date Analyzed:	Non-Responsive	Report Date:	6/11/2013
Attention:	Non-Responsive						

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments
Analysis Method fr Analysis Method F N/A = Not Applical %Pb = percent lea Note: All samples Note: All results ha	or Flame: Air, Wipes, for Furnace: Air, Wip ble mg/Kg = par d on a dry weight bas were received in good ave two significant dig	Paints, and Soil/S es, Paints, and So rts per million (ppm sis ug = microg d condition unless jits. Any additional	olids: EPA 600/F il/Solids : EPA 6 i) on a dry weight rams ug/L otherwise noted. digits shown	8-93/200(M)-7000 00/R-93/200(M)-7 basis mg/L = = parts per billion	0B; Water: SM-311 7010; Water: SM-3 parts per million (p n (ppb)	1B See Q 3113B associ 9m) sample	C Summary for an ated with these es.	alytical results of qua	ality control samples
Air and Wipe result Final results for air supplied information Ail results are to be change unless sign	ts are not corrected for and wipe samples and on nor verified by this e considered prelimin ned by the Technical	or any blank result re based on client laboratory. ary and subject to Director or Deputy.	5		Analyst: Suphi	Chinnapad	 Tee	hnical Manager: G	D Chrafy Edward Carney

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BEST AVAILABLE COPY 159202 OWI (410) 247-2024 210 REV. 6.08 AMA Analytical Services, Inc. (Please Refer To This Focused on Results www.amalab.com Number For Inquires) 516027 AIHA (#100470) NYLAP (#101143-0) NY ELAP (10920) CHAIN OF CUSTODY 4475 Forbes Blvd. . Lanham, MD 20706 (301) 459-2640 + (800) 346-0961 • Fax (301) 459-2643 page lofr Submittal Information: Mailing/Billing Information: ElKton - RC 1 STANATES 1. Client Name: National Guard Bureau EIKtin. mia 2. Obbilistation 2. Address 1: 301-IH Old Bay Lane P.O. #: W912K6-09-A-0003 3. Address 2: ____Attn: NGB-ARS-IHNE__ 3. Job #: 4. Contact Person @ phone # (410) 942-0273 4. Address 3: Havre de Grace, Maryland 21078 bons Fax #: (410) 942-0254 5. Southinked by 5. Phone #: (410) 942-0273 Reporting Information (Results will be provided as soon as technically feasible): NORMAGEBUSINESS HOURS) REPORT TO: AFTER HOURS (must be pre-scheduled) Include COC/Eield Data Sheets with Report 🖬 3 Day E mmediate Results Required By Noon Elimmediate Date Due:____ Compliance place ou 5 Day + D Next Day (ByeryAttempt Will Be 24 Hours Time Due: ____ G Fax: 2 Day Made to Accomodate) Comments:__ us.army.mil U Verb Metalsexnativits Ashestos analysis TEM Bulk QTY) D Pb Dust Wipe (wipe type CA *** Pb Air PCM Air - Please Indicate Filter Type: (OTY) ELAP 198.4/Chatfield 15 (OTY) NIOSH 7400_____ _(QTY) □ NY State PLM/TEM_ (QTY) DPb Air 3 (OTY) Fiberglass_ C Residual Ash. (OTY) D Pb Soil/Solid : (OTY) TEM Air -- Please Indicate Filter Type: TEM Dust PP LCT b (QTY) AHERA _(QTY) (QTY) Oual. (pres/abs) Vacuum/Dust____ Drinking Water D Pb (OTY) Cu (OTY) As (OTY) NIOSH 7402 (OTY) Quan. (s/area) Vacuum D5755-95 _____ __(QTY) (OTY) Cu____(QTY) As____(QTY) Waste Water D Pb (QTY) C Other (specify... Ouan, (s/area)Dust D6480-99_____ (OTY) D Pb Furnace (Media ... (OTY) PLM Bolk TEM Water 🔏 EPA 600 - Visual Estimate_ (OTY) Fungalamalysis Qual. (pres/abs)___ (OTY) EPA Point Count (OTY) Collection Apparatus for Spore Traps/Air Samples:.. G ELAP 198.2/EPA 100.2____ _(QTY) ONY State Friable 198.1. (OTY) Collection Media_ EPA 100.1____ (OTY) Gray, Reduction ELAP 198.6_ (OTY) O Spore-Trap____(OTY) Surface Vacuum Dust (OTY) Surface Swab (QTY) : Culturable ID Genus (Media (QTY) Other (specify_ All samples received in good condition unless otherwise noted. Culturable ID Species (Media MISC (TEM Water samples _°C) U Vermiculite Other (Specify____)___(QTY) Asbestos Soil PLM_(Qual) PLM_(Quan) PLM/TEM_(Qual) PLM/TEM_(Quan) CLIENT CONTACT SAMPHEINRORMANICON VOLUME WIPE SAMPLELOCATION CLIENT ID (LABORATORY STAFF ONLY) IDENTIFICATION DATE (LITERS) AREA NUMBER × Date/Time: Contact: Bv: 5-30 450 Den Hah × 450 × Converga RANCE 100 CM × 3 Darill Hall- Floor ÷ X Droll Halls Chaptorn! Х Date/Time: Contact: × By: Drin Hall - Table ~ × Kitchen Wilsee × Kitche - MICONAN-RAMMA CONVERSO FLOOR × Date/Time: Contact: By: محظ a converter Robert locks 10 Holling antride Aquetion × × \mathcal{V} × 11 BASTER CLASSING Derte MAM \sim à c 5- Walt offi a ne sú @ OOVia: FROLES 14 By (Print): Sign: 1. Date/Time RCVD:. LABORATORY Sign: Pester to MAR FOIA Reading Room BESTAVAILABLE COPY FOIA Requested Record #1-15-0085 (MD) Released by National Guard Bureau 3, Results Reported J Via: _ .Date: May 2018 (CUSTODY)

4. Comments: _

Page 2800 of 5269

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210 REV. 6.08 AMA Analutical Services, Inc. 516021 proce 2012 (Please Refer To This Focused on Results www.amalab.com Number For Inquires) **CHAIN OF CUSTODY** AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920) 4475 Forbes Blvd. . Lanham, MD 20706 (301) 459-2640 • (800) 346-0961 • Pax (301) 459-2643 Submittal Information: Mailing/Billing Information: ElKton nc 1 CONTRACTOR NUMBER 1. Client Name: National Guard Bureau 2. (BBCochion) ELKADNO m 13 2. Address 1: _____ 301-IH Old Bay Lane__ P.O. #: ____W912K6-09-A-0003 3. Job #: Address 2: Atln: NGB-ARS-IHNE (440) 048-0273 4. Contact Perso @ ph 4. Address 3: Havre de Grace, Marvland 21078 5. Sabhilteday Fax #: (410) 942-0254 5. Phone #: (410) 942-0273 Reporting Information (Results will be provided as soon as technically feasible): REPORT TO: (NORSIAL BUSINESSHOURS) AFTER HOURS (must be pre-scheduled) M Include COC/Field Data Sheets with Report C 3 Day D Immediate C Results Required By Noon Dimmediate Date Due: SI (CRAIN) D Next Day 2 5 Day + (EveryAttempt Will Be 24 Hours Time Due: _____ us.army.mil G Fax: Made to Accomodate) 🗋 2 Day Date Due: Comments: us.army.ml Q Verbals Metalssinalists Ashestos Analysis TEM Bulk D Pb Paint Chio_ (QTY) PCM Air -- Please Indicate Filter Type: ELAP 198.4/Chatfield_ (OTY) D Pb Dust Wipe (wipe type____ (YTO). D NIOSH 7400..... (QTY)NY State PLM/TEM (QTY) (OTY) 🖵 Pb Air_ C Fiberglass (QTY) C Residual Ash____ (OTY) Pb Soil/Solid -(OTY) TEM Air - Please Indicate Filter Type: TEM Dust D Pb TCLP_ (OTY) O AHERA _(QTY) Oual. (pres/abs) Vacuum/Dust____ _(QTY) Drinking Water D Pb____(QTY) D Cu____(QTY) D As____(QTY) O NIOSH 7402. _(OTY) Quan. (s/area) Yacuum D5755-95 (OTY)_(OTY) 🗆 Cu____(OTY) 🗆 As____(OTY) □ Waste Water □ Pb_____ C Other (specify____ (QTY) Quan. (s/area)Dust D6480-99_____ (QTY) Pb Furnace (Media _____) ____ (OTY) PLM Bulk TEM Water EPA 600 - Visual Estimate_ (QTY) Fungalexhallysis Qual. (pres/abs)_ EPA Point Count..... (OTY) Collection Apparatus for Spore Traps/Air Samples:_ C ELAP 198.2/EPA 100.2___ (OTY) ONY State Friable 198.1 (QTY)Collection Media G EPA 100.1 (OTY) Grav. Reduction ELAP 198.6_ (OTY) Spore-Trap____(QTY) Surface Vacuum Dust (OTY) (QTY) Other (specify____ All samples received in good condition unless otherwise noted. _(OTY) MISC (TEM Water samples _____°C) C Surface Tape_____ (QTY) Culturable ID Species (Media_ U Vermiculite C Other (Specify_____)___(QTY) CAsbestos Soil PLM_(Qual) PLM_(Quan) PLM/TEM_(Quan) PLM/TEM_(Quan) CLIENT CONTACT SAMPLEINFORMAUION VOLUME WIPE SAMPLE LOCATION CLIENT ID (LABORATORY STAFF ONLY) **IDENTIFICATION** DATE (LITERS) AREA NUMBER Date/Time: Contact: By: 100 " 10" × × 50. D.SL 5.30 13 Rear with to ¥., × 136- 046--Top of Jof. × \mathbf{x} 15 Commandon differen Book shis $\boldsymbol{\kappa}$ × J 16 2nd fl. CLASS TONN - toble ÷. ** Date/Time: By: Contact: 17 Black. Li \sim 0 × × 18 RIAUT . A 19 Ments BARNON BARNE × × Date/Time: Contact: By: Sign: ____ ø Via: By (Print): _____ 1. Date/Time RCVD:__ LABORATORY --- @-------BEST AVAILABLE COPY Poplection SP. FOIA Reading Room Sign:_ FOIA Requested Record #1-15-0085 (MD) 3, Results Reported To:___ Via: ____ Date:

May 2018 (CUSTODY)

4. Comments:

Page 2801 of 5269

Appendix B. Photographs



Exterior of facility



Drill Hall



Converted firing range/wall locker storage area



Green, black and red 9"X9" floor tile



Basement bathroom suspect asbestos damaged mudded joint fitting and pip insulation



Water damaged ceiling tiles throughout facility



Effloresce on exterior walls on the second floor

Appendix C. Floor Plan

ELKTON ARMORY FIRE PROTECTION PLAN



BASEMENT LEVEL

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Building Fire Exits

18 January 2013

Posted to NGB FOIA Reading Room May, 2018

FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2808 of 5269

MAIN FLOOR



FE Fire Extinguisher



18 January 2013

Posted to NGB FOIA Reading.Room May, 2018

LOCATION OF FIRE PROTECTION EQUIPMENT ELKTON ARMORY FIRE PROTECTION PLAN





Fire Extinguisher

Ξ

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 Standard Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2010.
- 5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.
- 6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.
- 7. National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.
- 8. National Ambient Air Quality Standards (NAAQS) National primary ambient air quality standards for carbon monoxide 40 CFR 50.8.
- 9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h) (3)].
- 10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM).
- 11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.
- 12. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.
- 13. ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.

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DEPARTMENT OF THE ARMY US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

May 2004

MEMORANDUM FOR Army National Guard Bureau (NGB) Region North Industrial Hygiene NGB-AVS-SI-IH. Non-Responsive, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03 CPT Michael Cresap Armory, Frederick, MD

1. Enclosed is a copy of subject report and one CD-ROM.

2. Please direct any additional comments or concerns to Ms. Non-Responsive, at DSN 584-5475/3118, commercial (410) 436-5475/3118 or e-mail address at Non-Responsive @apg.amedd.army.mil.

ENCL



Industrial Hygienist Industrial Hygiene Field Services Program



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U.S. Army Center for Health Promotion and Preventive Medicine



MDARNG FACILITIES IH BASELINE SURVEY CPT MICHAEL CRESAP ARMORY FREDERICK, MD 55-ML-01ED-03

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Readiness Thru Health

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U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed \$3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- Integrity is the foundation
- Excellence is the standard
- Customer satisfaction is the focus
- Its people are the most valued resource
- Continuous quality improvement is its pathway

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

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DEPARTMENT OF THE ARMY US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

EXECUTIVE SUMMARY MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS, CPT MICHAEL CRESAP ARMORY 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. Lead. All air samples are below the laboratory analytical detection limits for lead in air of 0.003mg/m³. The air is not believed to be an exposure pathway for lead in this facility. One surface dust-lead sample exceeded the USACHPPM recommended decontamination levels for lead. This elevated level of dust-lead may be contacted by the general workforce. Three surface dust-lead samples exceeded the EPA lead exposure levels for children under 6. There is a health risk to children from surface dust-lead in two rooms. Workers involved in renovation and abatement activities may be occupationally exposed to lead.

b. Mold. Excessive moisture from the leaking roof in the armory appears to have caused mold growth.

3. RECOMMENDATIONS.

The Department of Defense Risk Assessment Codes (RAC) for Health Hazards enables one to prioritize remedial action for hazards. Risk Assessments Codes range in magnitude from 1 to 5, with 1 being the highest priority.

a. Lead. The RAC for this armory for Lead Exposure is classified as 4. The RAC for Mold Exposure is 5. To minimize lead exposure, develop a written Lead Hazard Management Plan. Clean all areas in and adjacent to the converted indoor firing range where sampling results show elevated levels of lead. Comprehensive guidelines for cleaning are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities. These workers are required to be in compliance with the OSHA lead in construction standard 29 CFR 1926.62. There is a potential for taking lead contamination out of the workplace into their vehicles and homes. Wear disposable gloves and

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2815 of 5269 disposable coveralls as extra protection when working in areas identified as having elevated levels of lead. Address all potential lead hazards before extending this facility to use for children. If children will be using this facility, clean surfaces to the EPA dust-lead standards for young children of 40 μ g/ft² on floors and 100 μ g/ft² for dust-lead on window sills. Test drinking water from water fountains and faucets for lead.

b. Mold. To minimize exposure to mold, abate all areas of visible mold following the most current Army guidance in the USACHPPM Technical Guide 277 Army Facilities Management Information Document on Mold Remediation Issues, February 2002 in Appendix G. The roof will be replaced in late August 2003.

TABLE OF CONTENTS

Paragraph

Page

1.	AUTHORITY	.1
2.	PURPOSE OF EVALUATION	.1
3.	BACKGROUND INFORMATION	.1
4.	SUMMARY OF ACTIONS	.1
5.	ASSESSMENT CRITERIA FOR LEAD	.2
6.	SAMPLING RESULTS	.2
7.	DISCUSSION	.3
8.	CONCLUSIONS	.3
9.	RECOMMENDATIONS	.4
10.	ADDITIONAL ASSISTANCE	.4

Enclosure

1.	Lead Exposure	5
2.	Mold Exposure	5
3.	Additional Recommendations	5

Appendices

A ASSESSMENT CRITERIA FOR LEAD	A-1
B SITE MAPS	B-1
C PHOTOGRAPHS	C-1
D SAMPLING SHEETS AND LAB ANALYSES	D-1
E REFERENCES	E-1
F LEAD CLEANING GUIDANCE	F-1
G MOLD GUIDANCE	G-1



DEPARTMENT OF THE ARMY US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03

LOCATION: CPT Michael Cresap Armory, Frederick, MD

1. AUTHORITY. E-Mail dated 28 February 2003 from Ms Non-Responsive, Industrial Hygienist, MD Army National Guard, to the USACHPPM Industrial Hygiene Field Services Program.

2. PURPOSE OF EVALUATION. To conduct surveys at Army National Guard (ARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions at ARNG facilities. The survey will serve to establish a baseline so that a worker's history of exposures is provided for each civilian or military employee.

3. BACKGROUND INFORMATION.

a. Armory Mission. Infantry and Communications 1st Battalion, 115 Infantry Regiment, Company B.

- b. Date of Construction. 1980.
- c. POC. SGM^{Non-Responsive} (410)702-9772; (410)446-2972.
- d. Survey Date. 7 August 2003.

4. SUMMARY OF ACTIONS.

a. Sampling. Surface dust-lead wipe and air sampling was conducted to determine the existence of lead-based paint and/or lead-based paint hazards (paint-lead hazards). Sample locations are in Appendix D.

b. Physical Condition of Facilities.

(1) Paint. All paint was in an intact condition. Asbestos. Staff Sergeant Non-Responsive Environmental Compliance Assessment Coordinator for the MD NGB, stated that all lead and asbestos has been abated.

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2818 of 5269

(2) Mold. The armory POC stated that the roof leaked causing mold growth. (photo # 1468). Funding has been received for a new roof. The roof is scheduled to be installed in late August.

(3) Safety Hazards. No safety hazards were observed.

c. Other Building Issues. SGT offices were recently renovated. New duct work was installed to give supply air to the offices.

d. Safety and Industrial Hygiene Programs. There are no written program records at the armory.

e. Heating, Ventilation, and Air-conditioning System (HVAC). There is a central HVAC system. At the time of our visit it was not working up to capacity. The armory manager ordered a new pulley for the fan supplying office area ventilation.

f. Noise Dosimetry. No operation that could produce hazardous noise levels was identified.

g. Lighting. All areas appeared to be adequately lit and occupants reported no areas of deficient lighting. No measurements were taken.

h. Converted indoor firing range (IFR). The old IFR was converted to a storage garage for the tractor.

i. Photographs (Appendix C).

j. Site Maps (Appendix B).

k. Facility use by children. The POC stated that the use of this facility for children is occasional.

5. ASSESSMENT CRITERIA FOR LEAD. (Appendix A).

6. SAMPLING RESULTS. Lead in air and surface dust-lead wipe sample results are shown in Appendix D. All air sample results were below the laboratory analytical detection limits of 0.003 mg/m^3 lead in air. One of 7 surface dust-lead wipe samples exceeded the USACHPPM recommended decontamination level of $200 \mu \text{g/ft}^2$ for floors and other frequently-contacted surfaces. Three surface dust-lead wipe samples exceeded the EPA lead exposure levels for children under 6.

7. DISCUSSION.

a. Lead. The surface dust-lead wipe sample exceeding USACHPPM decontamination guidance was collected on the floor in the back of the IFR where the baffle used to be (1459). Three surface dust-lead wipe samples exceeded the EPA lead exposure levels for children. The first was on the floor in the back of the IFR where the baffle used to be (1459); the second on the floor of the IFR in front of where the baffle used to be (1460); and the third on the floor of the storage area adjacent to the old IFR near the NBC cage. EPA regulations define dust-lead standards for young children in child-occupied facilities. The EPA standard for dust-lead on floors is 40µg/ft², and 100µg/ft² for dust-lead on window sills. These levels were developed for children under 6 spending at least 60 hours per year in pre-1978 facilities. Two surface dust-lead samples collected in this armory exceeded these standards and one of these samples greatly exceeded the standard. Although this armory does not meet the EPA definition of childoccupied facility's minimum time requirement for child use, USACHPPM believes that there is a potential hazard for children using this facility. AR 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them. Although this facility may comply with EPA and Army regulations, exposures for children under 6 may exceed those that the regulations are intended to prevent.

b. The mold growth observed can be remediated by following USACHPPM guidance in Appendix G.

8. CONCLUSIONS.

a. All air samples are below the laboratory analytical detection limit for lead in air of 0.003 mg/m^3 .

b. One surface dust-lead sample is above the USACHPPM recommended decontamination levels.

c. Three surface dust-lead samples exceeded the EPA lead exposure levels for children under 6. One of these samples greatly exceeded the standard. There is a potential health risk to children from surface dust-lead in two rooms in the armory.

d. Elevated levels of dust-lead exist on surfaces that may be contacted by the general workforce.

e. Workers involved in renovation and abatement activities may be occupationally exposed to lead.

f. Excessive moisture from the leaking roof in the armory appears to have caused mold growth. The roof will be replaced.

9. RECOMMENDATIONS. Enclosure.

10. ADDITIONAL ASSISTANCE. For additional assistance, or questions concerning this report, please contact the undersigned at DSN 584-3118, commercial 410-436-3118, or by e-mail Non-Responsive apg.amedd.army.mil.



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

4

ENCLOSURE

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 4. The RAC for Mold Exposure is classified as 5.

1. RAC #1. Lead Exposure.

a. Develop a written Lead Hazard Management Plan for CPT Michael Cresap Armory.

b. Clean all areas in and adjacent to the old IFR where sampling results showed elevated levels of lead. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup.

c. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities. These workers are required to be in compliance with the OSHA lead in construction standard 29 CFR 1926.62.

d. There is a potential for personnel taking lead contamination out of the workplace into their vehicles and homes. Wear disposable gloves and disposable coveralls as extra protection when working in areas identified as having elevated levels of lead.

e. Test drinking water from water fountains and faucets for lead. It could not be determined if this has been done.

f. Address all potential lead hazards before extending this facility to use for children. If children will be using this facility, clean surfaces to the EPA dust-lead standards for young children of $40 \ \mu g/ft^2$ on floors and $100 \ \mu g/ft^2$ for dust-lead on window sills.

2. RAC # 2. Mold Exposure.

Abate all areas of visible mold following the most current Army guidance on page 12 of USACHPPM Technical Guide 277 Army Facilities Management Information Document on Mold Remediation Issues, February 2002 in Appendix G.

3. Additional Recommendations. Replace the leaking roof.

5

APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

Subject: Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than $200 \ \mu g/ft^2$. This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. EPA standards (40 CFR 745.227(e)(8)(viii))are not directly applicable because they are developed for floors (40 μ g/ft²), windowsills (250 μ g/ft²) and window troughs (400 μ g/ft²) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. OSHA has no specific requirement for work area surfaces. The lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. OSHA used to cite a level of 200 μ g/ft² in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 μ g/ft² is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels above these recommendations do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All states will receive this guidance when it is completed.

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m³ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

APPENDIX B

SITE MAPS



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APPENDIX C

PHOTOGRAPHS

Photo Number	Photo Location
1459	Former IFR floor (in back of where baffle used to be)
1460	Former IFR floor (in front of where baffle used to be)
1462	Office area directly adjacent to former IFR
1463	Floor outside former IFR door
1464	Cabinet near ventilation in former IFR
1465	Drill arca floor outside former 1FR
1466	Storage area floor outside former 1FR near NBC cage
1468	Mold growth caused from roof leak


1459

1460



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2830 of 5269







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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2831 of 5269





1466

1468

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2832 of 5269 MDARNG Facilities IH Baseline Surveys, CPT Michael Cresap Armory, Frederick, MD Project No. 55-ML-01ED-03

APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

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			Indoor Range Info					
Yfipe Sample #	Armory	City	Active	Mactive	NA	Cleaned?	keaned? Location of Samples {µ	
			Νο			Unknown		
[[
FRW0L	Frederick	Frederick		1			Former IFR floor (in back of where baffle used to be)	834
FR02	Frederick	Frederick						
	Frederick	Frederick					Former IFR floor (in front of where baffle used to be)	57
FRW03	Frederick	Frederick	Ī					
	Frederick	Frederick	ŀ				Office area directly adjacent to former IFR	BDL
FRW04	Frederick	Frederick						
	Frederick	Frederick					Floar outside farmer IFR door	27
FRW05	Frederick	Frederick]					
	Frederick	Fredenck					Cabinet near versilation in former IFR	BDL
FRW06	Frederick	Frederick						
	Frederick	Frederick					Drill area floor outside former IFR	BDL
FRW07	Frederick	Frederick						
	Frederick	Frederick					Storage area floor outside former IFR near NBC cage	97



TEST REPORT Page 1 of 2 8/22/03

Submitted To:

Non-Responsive

US Army CHPPM Bldg. 1570 Stark Road APG, MD 21015

Reference Data: Client Sample No.: P.O. No.: Sample Location: Sample Type: Method Reference: DCL Set ID No.: DCL Sample ID No.: Sample Receipt Date: Preparation Date: Analysis Date: Lead SPAS01 through Blank01 Not Available Fredrick NG Armory & OMS Filter NIOSH 7300 03-S-3990 03-24663 through 03-24667 8/19/2003 08/20/03 08/20/03

The samples were prepared and analyzed in accordance with NIOSH method 7300 using a Perkin Elmer 3000XL ICP.

The sample condition upon receipt was acceptable except where noted.

The results are in the enclosed data table. Results relate only to the items tested and are not blank corrected unless indicated in the data table.

This report shall not be reproduced except in full, without the written approval of the laboratory.







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

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2835 of 5269



Results Lead

Client #	DCL #	Sample	$\mu g/sample$	mg/m ³
		Volume (L)		
SPAS01	03-24663	325.2	ND	<0.003
SPAS02	03-24664	297.8	ND	<0.003
SPAS03	03-24665	332.3	ND	<0.003
Blank02	03-24666	0	ND	_
Blank01	03-24667	0	ND	-
	Prep Blank		ND	
<pre>% Recovery</pre>	LCS		99.	
RPL			1.	

ND = not detected at or above the reporting limit (RPL). LCS = laboratory control sample.



Analyst







ANALYTICAL REQUEST FORM

REGULAR Status (5 working days from receipt)

RUSH Status Required - ADDITIONAL CHARGE RESULTS REQUIRED BY______

CONTACT DATACHEM LABS PRIOR TO SENDING SAMPLES

Date	Purchase Order No.			Quote No
Company Name	COMMANDER, US ATTN: MCHB-T	ACHPPM S-OFS		Sample Collection
Address	5158 BLACKHAW APG, MD 21010	K ROAD)-5403		Sampling Site FREDELCK NG ARMORY+C
City	Non Room			Industrial Process
Person to Conta	Non-Respo	JISIVE	2φ	Date of Collection 5 Aug 03
Telephone (4/C	1 436 - 3118	3		Time Collected
ax Telephone ((410) 436-57	(71		Date of Shipment
Billing Address ((if different from above)		QC Require
MD NG	affice			Collector's I
Havre de	Grace, Mi	2		Signature
REQUEST FOR	ANALYSES	C	13-5-	3190
Laboratory	Client Sample Number	Media Type*	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
14663	SPASOI		325.2	LEAD - NIOSH 7300
24664	SPASOZ		297.8	LEAD - NIOSH 7300
14665	SPAS 03		332.3	LEAD - NIOSH 7300
24666	BLANKOZ			LEAD-NLOSH 7300
24667	BLankol			Lead - N 1054 7300
	97 - 14, 53, 5			
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4388 Glendale Milford Road / Cincinnati, OH 45242 • 800-458-1493 or 513-733-5336 / Fax: 513-733-5347

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TEST REPORT Page 1 of 2 8/22/03



Submitted To:

US Army CHPPM Bldg. 1570 Stark Road APG, MD 21015

Reference Data: Client Sample No.: P.O. No.: Sample Location: Sample Type: Method Reference: DCL Set ID No.: DCL Sample ID No.: Sample Receipt Date: Preparation Date: Analysis Date: Lead SPAS01 through Blank01 Not Available Fredrick NG Armory & OMS Filter NIOSH 7300 03-S-3990 03-24663 through 03-24667 8/19/2003 08/20/03 08/20/03

The samples were prepared and analyzed in accordance with NIOSH method 7300 using a Perkin Elmer 3000XL ICP.

The sample condition upon receipt was acceptable except where noted.

The results are in the enclosed data table. Results relate only to the items tested and are not blank corrected unless indicated in the data table.

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Non-Responsive



CINCINNATI OFFICE 4388 GLENDALE-MILFORD ROAD CINCINNATI, OHIO 45242-3708 513 733-5336, FAX 513 733-5347 WEST COAST OFFICE 11 SANTA YORMA COURT NOVATO, CALIFORNIA 94945 800 280-8071; FAX 415 893-9469

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TEST REPORT Page 2 of 2 03-S-3990

Results Lead

Client #	DCL #	Sample Volume (L)	µg/sample	mg/m ³
SPAS01	03-24663	325.2	ND	<0.003
SPAS02	03-24664	297.8	ND	<0.003
SPAS03	03-24665	332.3	ND	<0.003
Blank02	03-24666	0	ND	
Blank01	03-24667	0	ND	-
	Prep Blank		ND	
<pre>% Recovery</pre>	LCS		99.	
RPL			1.	

ND = not detected at or above the reporting limit (RPL).

LCS = laboratory control sample.





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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2839 of 5269

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896 AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS:

LEAD BY WIPE SAMPLING

RES Job Number: Client: Client Project Number / P.O.: Client Project Description: Date Samples Received: Analysis Type: Turnaround: Date Samples Analyzed: RES 96596-1 Army National Guard III - West None Given August 19, 2003 USEPA SW846 3050B / AA(7420) 3-5 Day August 22, 2003

Client	Lab	Sample	LEAD	Detection	LEAD
1D Number	ID Number	Area	(µg)	Limit	CONCENTRATION
		(sq.ft.)		(µg/sq.ft.)	(µg/sq.ĺt,)
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
FRBLANKOL	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
FRWM	EM 806522	0.11	3.0	23	27
FR: ₩05	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.fl. Sample Area Unless Otherwise Noted



BDI. = Below Detection Limit

Ξ Data Qa

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2840 of 5269



Invoice to:

Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211 (303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

REMIT TO: 2059 Bryant St. Denver, CO 80211

Army National Guard IH - West 3401 Quebec Street, Suite 7200 Denver CO 80207 Invoice Date: August 26, 2003 Invoice Number: RES 96596-1

TERMS:

Net 30 Days

Service Charge of 18% per annum may by charged on past due invoices.

Quantity		Unit Price	Amount			
	RES Job #: Desc: Submitted By: P/O No: Contact:	RES 96596-1 None Given Army National G None Given Non-Responsive	uard IH - West			
25	AA/ICP Metal	Wipe	3-5 Day	4125-02	\$7.50	\$187.50
				Ir	voice Total:	\$187.50

	RESERVOIRS	ENVIRONMENTAL.	INC.
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APPENDIX E

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APPENDIX E

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APPENDIX F

LEAD CLEANING GUIDANCE

CHAPTER 14: CLEANING

Ste	ep-t	by-Step Summary 14–3
I.	Int	troduction
	Α.	Performance Standard
	В.	Small Dust Particles
	C.	Difficulties in Cleaning 14-5
		1. Low Clearance Standards 14–5
		2. Worker Inexperience
		3. High Dust-Producing Methods and/or Inadequate Containment 14–6
		4. Deadlines
II.	Со	ordination of Cleaning Activities 14-6
	Α.	Checklist
	Β.	Equipment Needed for Cleaning 14-6
	C.	Waste Disposal
III.	Cle	eaning Methods and Procedures 14-7
	Α.	Containment 14–7
	Β.	Basic Cleaning Methods: Wet Wash and Vacuum
		Cleaning Techniques
		1. HEPA Vacuuming
		2. Wet-Detergent Wash
		3. The HEPA/Wet Wash/HEPA Cycle
		4. Sealing Floors
IV.	Or	der of Cleaning Procedures During Lead Hazard Control 14–16
	Α.	Precleaning Procedures
	Β.	Ongoing Cleaning During the Job
	C.	Daily Cleaning Procedures
		1. Large Debris
		2. Small Debris
		3. Exterior Cleaning
		4. Worker Protection Measures
		5. Maintaining Containment

_

V.	Or	rder of Final Cleaning Procedures After	
	Le	ead Hazard Control 1	4–19
	Α.	Final Cleaning 1	4–19
		1. Decontamination of Workers, Supplies, and Equipment 1	4–19
	В.	Preliminary Visual Examination 1	4–20
	С.	Surface Painting or Sealing of Nonfloor Surfaces 1	4–20
	D.	Final Inspection 1	4–20
	E.	Recleaning After Clearance Failure 1	4–20
VI	Cle	eaning Cost Considerations 1	4–21
	Α.	Initial Clearance Test Failure Rates 1	4–21
	В.	Key Factors In Effective Cleaning 1	4–21
	C.	Special Problems 1	4–21
VI	I. A	Alternative Methods 1	4–22
	Α.	Vacuums 1	4-22
	В.	Trisodium Phosphate and Other Detergents 1	4–22

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Step-by-Step Summary



- 1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
- 2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
- 3. Have sufficient cleaning equipment and supplies before beginning work.
- 4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
- 5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
- 6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
- 7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
- 8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
- 9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
- 10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
- 11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
- 12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
- 13. Paint or otherwise seal treated surfaces and interior floors.
- 14. Conduct a clearance examination (see Chapter 15).
- 15. If clearance is not achieved, repeat the final cleaning.



- 16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.
- 17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.
- 18. Cleaning equipment list:
 - HEPA vacuums.
 - Detergent.
 - Waterproof gloves.
 - Rags.
 - Sponges.
 - Mops.
 - Buckets.
 - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
 - 6-mil plastic bags.
 - Debris containers.
 - Waste water containers.
 - Shovels.
 - Rakes.
 - Water-misting sprayers.
 - ✤ 6-mil polyethylene sheeting (or equivalent).

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris and dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning

procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 µg/ft² on floors.
- 500 μg/ft² on interior window sills (stools).
- 800 µg/ft² on window troughs (the area where the sash sits when closed).
- 800 μg/ft² on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.



2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?

- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).



C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and 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 finedust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.



Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards and were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and prefilter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the prefilter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a highphosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several



Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wetwash process.

Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

✤ First, the area is HEPA vacuumed.



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Chapter 14: Cleaning

- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2858 of 5269

14-13

Figure 14.4c (continued)

Wash all surfaces with suitable detergents

Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces



Wet Mop Floor



Don't Dry Sweep

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Figure 14.4d (continued)

HEPA vacuum all surfaces a final time HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the



Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's



Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.



belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will



Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- ♦ Securing debris/plastic.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6mil 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 plasticremoval 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).
Chapter 14: Cleaning -



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,

Chapter 14: Cleaning

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

Chapter 14: Cleaning



option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dustretaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table	14 1	Initial	Cleaning	Wine-Test	Failure	Rates for	Various	Abatement	Strategies
labic	17.1	million	cicaring	vvipc-icst	i anui c	Rates IOI	various	Abatement	Juaccyles

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.

Mass Removal Efficiency Percentages Cycle Number **Cleaning Method** Central Central **HEPA Vacuum** Portable Vacuum—Plain Vacuum—Agitator Vacuum—Plain Tool Head Tool 1 34.7 71.0 17.5 55.4 2 47.0 80.2 61.2 23.0 3 51.9 85.9 66.3 26.6 87.8 67.0 4 56.0 29.4 59.3 88.9 5 72.1 32.5 6 61.6 91.2 74.4 34.9 7 63.8 93.1 76.4 36.5 67.5 95.4 38.1 8 77.5 9 67.5 97.7 78.7 40.1 67.2 80.2 10 100.0 41.7 11 102.3 80.2 41.7 44.8 12 104.6 84.1 84.5 13 104.6 46.8 14 103.8 84.5 48.4 15 49.6 50.8 16 17 52.4 18 53.6 54.4 19 20 55.2

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) Effectiveness of Clean-up Techniques for Leaded Paint Dust

14-23

MDARNG Facilities IH Baseline Surveys, CPT Michael Cresap Armory, Frederick, MD Project No. 55-ML-01ED-03

APPENDIX G

MOLD GUIDANCE

Army Facilities Management Information Document on Mold Remediation Issues

TG 277 FEBRUARY 2002



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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

TABLE OF CONTENTS

INTRODUCTION	2
MOLD PREVENTION TIPS	3
REMEDIATION PLANNING	3
REMEDIATE MOISTURE AND MOLD PROBLEMS	3
REMEDIATION PROCEDURES	4
FOUR REMEDIATION LEVELS	4
HAZARD COMMUNICATION	9
CONCLUSION	10
REFERENCES	10
APPENDIX A: WATER DAMAGE CLEANUP AND MOLD PREVENTION	11
APPENDIX B: MOLD REMEDIATION GUIDELINES	14
APPENDIX C: PERSONAL PROTECTIVE GUIDANCE	17
APPENDIX D: CONTAINMENT GUIDANCE	19

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

Concern about indoor exposure to mold has been increasing as the public becomes more aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions.

This document provides the best and most current guidance for remediation of clean water damage (<48 hours) and mold contamination (>48 hours) into one resourceful Army guide. This guide has been designed to provide information to facilities management individuals who have little or no experience with mold remediation. It will assist them in making a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to develop or evaluate an in-house remediation plan or evaluate a remediation plan submitted by an outside contractor. If an outside contractor is employed, they must have experience cleaning up mold. Check their references, and have them follow the recommendations presented in this document, EPA guidelines, and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). A multi-disciplinary team approach to mold concerns is best. A health and safety professional, such as an industrial hygienist, should be consulted prior to any remediation activities to assist in the project.

Molds produce tiny spores to reproduce. Mold spores float through the indoor and outdoor air continually. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or uncorrected. There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.(1)

In all situations, the underlying cause of water accumulation must be rectified or mold growth will recur. Any initial water infiltration should be stopped and clean up began immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth. (Refer to Appendix A for detailed guidance on clean water damage response). If the source of water is elevated humidity, actions to maintain the relative humidity levels below 60% to inhibit mold growth should be taken (2). Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilating, and air-conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide adequate drainage and slope the ground away from the foundation.

REMEDIATION PLANNING

- Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Select cleanup methods for moldy items (Appendix B)
- Select Personal Protection Equipment (PPE)- protect remediators (Appendix B)
- Select containment equipment protect building occupants (Appendix B)
- Select remediation personnel who have the experience and training needed to implement the remediation plan and use PPE and containment as appropriate

REMEDIATE MOISTURE AND MOLD PROBLEMS

- Fix moisture problem, implement repair plan and/or maintenance plan
- Dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Clean and dry moldy materials (Appendix B)
- Discard moldy porous items that can't be cleaned (Appendix B)

REMEDIATION PROCEDURES

Four levels of abatement are described below. The size of the area impacted by mold contamination primarily determines the type of remediation. The sizing levels below are based on professional judgment and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of mold and preventing dust contaminated with mold from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement. The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. (3)

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be discarded if possible. All materials to be reused should be dry and visibly free from mold. Routine inspections should be conducted to confirm the effectiveness of remediation work. (1 and 3)

The use of bleach or other biocides is questionable in most cases (8). The effectiveness of bleach in reducing living mold is dependent on concentration, residual chlorine levels, and contact time on the surface (8). All of these factors are difficult to control during remediation. Removal of all mold growth can generally be accomplished by physical removal of materials supporting active growth and thorough cleaning of non-porous materials (4). Therefore, application of a biocide serves no purpose that could not be accomplished with a detergent or cleaning agent (4).

The use of gaseous ozone or chlorine dioxide for remedial purposes is **not** recommended. Both compounds are highly toxic and contamination of occupied space may pose a health threat. Furthermore, the effectiveness of these treatments is unproven. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."(4)

FOUR REMEDIATION LEVELS

[Adapted from NYCDOH Guidelines on Assessment and Remediation of Fungi in Indoor Environments (3) and EPA (1)]

Level I: Small Isolated Areas – Total surface area affected less than 10 square feet - e.g., ceiling tiles, small areas on walls. Refer to Appendix B for detailed guidance.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and doublebagged 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 doublebagged 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.

TG 277

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 doublebagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft²) follow Level I guidance for PPE and containment and for a areas (>10 ft²) follow Medium (Level II) or when greater than 100 ft² follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended (7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and removed in double-bagged 6-mil plastic. When a decontamination room is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

All areas should be left dry and visibly free from contamination and debris.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air (4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If remediation sampling is necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HAZARD COMMUNICATION

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

- 1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.
- 2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.
- New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.
- 4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.
- 5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.
- 6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500*, *Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.
- 7. Occupational Safety & Health Administration. *Respiratory Protection Standard*, 29 *Code of Federal Regulations 1910.134*. 63 FR 1152. January 8, 1998.
- 8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force*, AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water D	amage - Cleanup and Mold Prevention			
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£				
Water-Damaged Material†	Actions			
Books and papers	 For non-valuable items, discard books and papers. Photocopy valuable/important items, discard originals. Freeze (in frost-free freezer or meat locker) or freeze-dry. 			
Carpet and backing - dry within 24-48 hours§	 Remove water with water extraction vacuum. Reduce ambient humidity levels with dehumidifier. Accelerate drying process with fans. 			
Ceiling tiles	Discard and replace.			
Cellulose insulation	• Discard and replace.			
Concrete or cinder block surfaces	 Remove water with water extraction vacuum. Accelerate drying process with dehumidifiers, fans, and/or heaters. 			
Fiberglass insulation	Discard and replace.			

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Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	 Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. Check to make sure under flooring is dry; dry under flooring if necessary. 			
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.			
Upholstered furniture	 Remove water with water extraction vacuum. Accelerate drying process with dehumidifiers, fans, and/or heaters. May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture. 			
Wallboard (Drywall and gypsum board)	 May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. Ventilate the wall cavity, if possible. 			
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.			
Wood surfaces	 Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. Wet paneling should be pried away from wall for drying 			

Ξ

£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.

These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

[†] If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*					
Material or Furnishing Affected Cleanup Methods† Personal Protective Equipment Containment					
	SMALL - Total S	urface Area Affected Less Than 10 square	feet (ft ²)		
Books and papers	3				
Carpet and backing	1, 3				
Concrete or cinder block	1, 3	Minimum N-95 respirator, gloves, and goggles			
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3				
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		None required		
Upholstered furniture & drapes	1, 3				
Wallboard (drywall and gypsum board)	3				
Wood surfaces	1, 2, 3				

MEDIUM - Total Surface Area Affected Between 10 and 100 ft ²						
Books and papers	3					
Carpet and backing	1,3,4					
Concrete or cinder block	1,3					
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area			
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					
LAF Increased Oc	LARGE - Total Surface Area Affected Greater Than 100 ft ² or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant					
Books and papers	3					
Carpet and backing	1,3,4					
Concrete or cinder block	1,3	Full	Full			
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider	Use professional judgment, consider potential for remediator exposure and size of contaminated area			
Non-porous, hard surfaces (plastics, metals)	1,2,3	and size of contaminated area				
Upholstered furniture & drapes	1,2,4					
Wallboard (drywall and gypsum board)	3,4					
Wood surfaces	1,2,3,4					

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

*Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips

- Always maintain the containment area under negative pressure.
- Exhaust fans to outdoors and ensure that adequate makeup air is provided.
- If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278 February 2002



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Table of Contents

Introduction
Safety Tips While Investigating And Evaluating Mold And Moisture Problems
Communicate With Building Occupants At All Stages Of Process, As Appropriate 3
Routine Investigation And Evaluation Of Moisture And Mold Problems
Assessments Requiring Sampling 3
References 4
APPENDIX A: Mold Investigation Decision Logic
APPENDIX B: Mold Remediation Guidelines8
APPENDIX C: Personal Protective Equipment11
APPENDIX D: Containment Guidance13

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*¹ will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination².

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate¹.

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems³.

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination².

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air⁴. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control⁴."

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program. For further mold assistance, contact USACHPPM, Industrial Hygiene Field Services Program, DSN 584-3118 or (410) 436-3118.

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

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MOLD INVESTIGATION DECISION LOGIC



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MOLD INVESTIGATION DECISION LOGIC NOTES:

1. Roughly approximate the total surface area of visible mold. Categorization of the remediation levels are sometimes borderline, so when trying to decide the category to apply, consider the extent of visible growth, such as a heavy blanket of growth on the surface, to barely visible. If heavy growth is apparent, consider moving up to the next level of protection.

2. Do not skip this step. Address the source of water or moisture problem or the mold will simply reappear.

3. Always protect the health and safety of the building occupants and remediators.

4. Mold may be hiding on the backside of drywall, vinyl wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads. Check walls behind furniture, pipe chases and utility tunnels, porous thermal or acoustic liners inside ductwork, or check the rafters (due to roof leaks or insufficient insulation)³.

5. Utilize appendices B and C for remediation guidance. Use your best judgment during investigations, if not disturbing the mold you may need minimal to no PPE. Do not alarm building occupants unnecessarily, but protect yourself as necessary.

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities³. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.
Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*					
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment		
	SMALL - Total S	Surface Area Affected Less Than 10 squar	e feet (ft ²)		
Books and papers	3				
Carpet and backing	1, 3				
Concrete or cinder block	1, 3				
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3	Minimum			
Non-porous, hard surfaces (plastics, metals)	1, 2, 3	N-95 respirator, gloves, and goggles	None required		
Upholstered furniture & drapes	1, 3				
Wallboard (drywall and gypsum board)	3				
Wood surfaces	1, 2, 3				
	MEDIUM - To	tal Surface Area Affected Between 10 and	100 ft ²		
Books and papers	3				
Carpet and backing	1,3,4				
Concrete or cinder block	1,3				
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	Limited or Full Use professional judgment, consider	Limited Use professional judgment, consider		
Non-porous, hard surfaces (plastics, metals)	1,2,3	potential for remediator exposure and size of contaminated area	potential for remediator/occupant exposure and size of contaminated area		
Upholstered furniture & drapes	1,3,4				
Wallboard (drywall and gypsum board)	3,4				
Wood surfaces	1,2,3				
LARGE - Total Surface Area Affected Greater Than 100 ft ² or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant					
Books and papers	3				
Carpet and backing	1,3,4				
Concrete or cinder block	1,3	Full	Full		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider	Use professional judgment, consider		
Non-porous, hard surfaces (plastics, metals)	1,2,3	potential for remediator/occupant exposure potential for remediator exposure and size of contaminated area of contaminated area			
Upholstered furniture & drapes	1,2,4				
Wallboard (drywall and gypsum board)	3,4				
Wood surfaces	1,2,3,4				

TG 278

*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.
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- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

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Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

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APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips

- Always maintain the containment area under negative pressure.
- Exhaust fans to outdoors and ensure that adequate makeup air is provided.
- If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

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Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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National Guard Region North

National Guard Readiness Center Industrial Hygiene Evaluation Frederick Army National Guard Armory Frederick, MD 21701-6758

Prepared for:

National Guard Region North Industrial Hygiene Office 301 Old Bay Lane Havre De Grace, MD 21078

Attn:

n-Responsive

Prepared by:

Bonus Environmental, LLC P.O. Box 121 Mt. Pleasant, Michigan 48804

> Project No. 1061-03 August 4, 2010

Bonus Environmental, LLC

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TABLE OF CONTENTS

1.	EXE	CUTIVE SUMMARY	1
2.	LEA	D SAMPLING	2
	2.1	Lead Wipe Sampling	2
	2.2	Lead Air Sampling	2
3.	PHY	SICAL CONDITION OF FACILITY / PERSONNEL CONCERS	3
	3.1	Lead Based Paint	3
	3.2	Presumed Asbestos Containing Materials	4
	3.3	Water Damage/Mold Growth	4
	3.4	Housekeeping	4
	3.5	Employee Interviews	4
	3.6	Indoor Air Quality	4
4.	LIG	HTING SURVEY	6
5.	COI	NCLUSION	6

APPENDICES

Appendix A	Shop Diagram
Appendix B	Lead Sample Results
Appendix C	Photographs
Appendix D	References



August 4, 2010 Project No. 1061-03

National Guard Region North Industrial Hygiene Office 301 Old Bay Lane Havre De Grace, MD 21078-4003

Attn: Non-Responsive

Project: Army National Guard Readiness Center, Industrial Hygiene Evaluation Frederick 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 Frederick Army National Guard Readiness Center located at 8501 Old National Pike in Frederick, Maryland. The purpose of this evaluation was to generate or to update a previous baseline evaluation so that employee exposure history can be provided to each civilian and military employee. The following industrial hygiene and safety programs were evaluated during this industrial hygiene evaluation performed by Bonus Environmental, LLC representative Non-Responsive on May 17, 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 Frederick Readiness Center is an Army National Guard armory comprised of offices, a drill hall, a kitchen, a fitness room, a boiler room, a classroom, a conference room, and a lounge. The point of contact for this facility was SFC **Non-Responsive**. Four (4) full-time administrative personnel are employed in the approximately 20,350 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.

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2.0 – LEAD SAMPLING

2.1 – Lead Wipe Sampling

Lead wipe sampling was performed according to the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame). Seventeen (17) wipe samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. The following table outlines the locations and analytical results for the lead wipe samples collected during this project

	Army National Guard – Frederick Readiness Center				
	Lead Wipe Sample Results				
Sample #	Sample Date	Sample Location	Sample Area (ft ²)	Sample Result (µg/ft²)	
F-W-1	5-17-10	Field Blank		< 12	
F-W-2	5-17-10	Drill hall, NW corner, on Internet Access Point keyboard	0.111	< 110	
F-W-3	5-17-10	Drill hall, west wall, top of water dispenser	0.111	< 110	
F-W-4	5-17-10	Drill hall, SE corner, top of "Amnesty box"	0.111	< 110	
F-W-5	5-17-10	Drill hall, floor, south end "free throw" line	0.111	< 110	
F-W-6	5-17-10	Drill hall, floor, north end "free throw" line	0.111	< 110	
F-W-7	5-17-10	Room 114 (former indoor firing range), north end, light fixture	0.111	< 110	
F-W-8	5-17-10	Room 114 (former indoor firing range), east wall-center, top of locker	0.111	< 110	
F-W-9	5-17-10	Room 114 (former indoor firing range), center of room, floor	0.111	290	
F-W-10	5-17-10	Stairwell handrail leading to room 101, SW of room 114	0.111	< 110	
F-W-11	5-17-10	Room 119, kitchen, on prep table	0.111	< 110	
F-W-12	5-17-10	Room 110, on bar table surface0.111< 110		< 110	
F-W-13	5-17-10	.0 North lobby area, on trophy cabinet 0.111 <11		< 110	
F-W-14	5-17-10	Room 117-1, above entrance door, supplied-air grill0.111< 110		< 110	
F-W-15	5-17-10	Room 102, top of copy machine 0.111 < 110		< 110	
F-W-16	5-17-10	Room 103, center of room, table top surface	0.111	< 110	
F-W-17	5-17-10	Room 117-2, boiler room, top of boiler	0.111	< 110	
F-W-18	5-17-10	Room 116-2, storage room, west side shelf	0.111	140	

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

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NGB /Frederick Army National Guard Readiness CenterAugust 4, 2010Project No. 1061-03Page 3

determination whether any employee's exposure exceeds the action level (AL) of 30 μ g/m³ or the maximum permissible exposure limit (PEL) of 50 μ g/m³ as 8-hour time weighted averages (TWAs). If employee exposures are less than 30 μ g/m³, 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 personal and 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 collected from an employee performing administrative tasks. Any employees performing a specific task utilized the same work practices. Employees not monitored for exposure to airborne lead dust can assume to have the same exposure as the monitored employees performing the same task.

Lead exposure monitoring was performed in accordance with the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame) with SKC personal air sampling pumps calibrated to 2.0 liters per minute. All samples were collected on 37 mm diameter cassettes with mixed-cellulose ester filters. All sampling pumps were calibrated before and after each use to ensure volume accuracy. Two (2) samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. Analytical results of the lead wipe and air samples are attached to this report as Appendix B.

		Army National Guard Lead Air	– Fred Sampl	erick R e Resul	eadines Its	ss Cento	er		
Sample #	Sample Type	Sample Location	Flow Rate	Start	Stop	Vol.	Rpt. Limit (μg/m ³)	Results (µg/m³)	8 hr TWA (μg/m³)
May 17,	2010	-	-	-	-				
F-A-1	FB	Field Blank				0	3.0	< 3.0	N/A
F-A-2	PS	Sgt. More responsed, working in office room 117-1	2.0	0827	1534	854	3.5	< 3.5	<u><</u> 3.1
F-A-3	IWA	Room 114, former indoor firing range, south end	2.0	0830	1533	846	3.5	< 3.5	N/A

PS = Personal sample, **IWA** = Inside work area, **N/A** = Not Applicable **Note**: The OSHA PEL of 50 μ g/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 Frederick Readiness Center, Bonus Environmental, LLC performed a visual inspection of the facility in regards to lead based paint. Bonus Environmental, LLC identified no areas of peeling paint which could potentially pose a lead exposure hazard.

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3.2 – Presumed Asbestos Containing Materials

During the industrial hygiene evaluation of the Army National Guard Frederick Readiness Center, Bonus Environmental, LLC performed a visual inspection to identify presumed asbestos containing materials (PACM) and, if found, to note their condition. Bonus Environmental, LLC did not identify any PACM that was considered to be in poor or damaged condition.

3.3 - Water Damage/Mold Growth

During the industrial hygiene evaluation of the Army National Guard Frederick Readiness Center, Bonus Environmental, LLC performed a visual inspection to report the location and perform an evaluation of any water damaged or visible mold problems. Bonus Environmental, LLC identified no water-damaged and/or moldy building materials during the survey.

3.4 - Housekeeping

During the industrial hygiene evaluation of the Army National Guard Frederick 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 Frederick Readiness Center, Bonus Environmental, LLC performed interviews and made observations to determine if the work activities being performed possessed any ergonomic concerns. Following the interviews and observations, no ergonomic and or indoor air quality concerns were identified.

3.6 – Indoor Air Quality

During the industrial hygiene evaluation of the Army National Guard Frederick Readiness Center, Bonus Environmental, LLC measured temperature, relative humidity, carbon monoxide (CO), and carbon dioxide (CO₂) throughout the facility. A calibrated TSI Q-Trak Model 7565 Indoor Air Quality Monitor equipped with a Q-Trak Probe 982 was utilized to record indoor air quality measurements.

Carbon dioxide is a natural component of air and the amount of 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 471 ppm to 612 ppm and indicate adequate ventilation within the facility.

P.O. Box 121 BESTAVALABLE 76894 *Mt. Pleasant, MI* 48804 FOIA Requested Record #915-0085 (MD) Released by National Guard Bureau Page 2914 of 5269



NGB /Frederick Army National Guard Readiness Center <u>Project No. 1061-03</u>

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 0.7 ppm to 2.4 ppm. CO levels were well below the OSHA PEL during this industrial hygiene evaluation.

During the industrial hygiene evaluation of the Army National Guard Frederick Readiness Center, Bonus Environmental, LLC collected temperature measurements. Temperature measurements throughout the facility ranged from 66.1°F to 77.1°F (except for a reading of 82.7°F in the boiler room) and are considered to be within an acceptable range.

During the industrial hygiene evaluation of the Army National Guard Frederick Readiness Center, Bonus Environmental, LLC collected relative humidity measurements. Relative humidity measurements throughout the facility ranged from 37.6% to 60.5% 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 – Frederick Readiness Center Indoor Air Quality Measurements					
Location	CO_2	CO	Relative	Temperature	
2000000	(ppm)	(ppm)	Humidity (%)	(°F)	
Outdoors, north side entrance	437	2.0	95.0	59.7	
Room 114, south end	493	0.7	55.3	72.0	
Room 101 (Drill hall), center of room	509	1.7	52.1	71.5	
Room 110	494	2.3	37.6	68.2	
North lobby area	471	1.7	55.4	66.7	
Room 117-1	531	1.5	56.9	66.7	
Room 102	491	1.6	57.0	66.1	
Room 103, south end	542	1.0	60.5	67.8	
Room 119 (Kitchen)	514	1.1	57.0	69.2	
Room 117-2 (Boiler room)	612	0.8	41.8	82.7	
Room 116-2	551	2.4	40.2	77.1	

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%

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NGB /Frederick Army National Guard Readiness Cente	r
<u>Project No. 1061-03</u>	

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 – Frederick Readiness Center				
Lig	ghting Survey			
Location	Measurement in	Requirement in Foot	Requirement	
	Foot Candles	Candles	Met?	
Room 114 – Storage (former indoor firing range)	11.4	30	NO	
Room 101 – Drill hall	12.8	30	NO	
Room 111 – Storage	51.3	30	YES	
Room north of room 111 – Office	43.8	50	NO	
Room 110 – Lounge	51.3	50	YES	
Room between rooms 110 & 109 – Office	94.4	50	YES	
Room 109 – Office	44.5	50	NO	
Room 117-1 – Office	59.2	50	YES	
Room 116-1 – Office	86.7	50	YES	
Room 102 – Conference room	45.3	30	YES	
Room 102A – Office	13.8	50	NO	
Room 105 – Women's restroom	40.1	5	YES	
Hallway outside of room 117-1	22.3	5	YES	
Room 104 – Men's restroom	58.6	5	YES	
Room 103 – Classroom	16.2	50	NO	
Room 103A – Storage	27.4	30	NO	
Room 120 – Storage	6.5	30	NO	
Room 119 – Kitchen	52.4	10	YES	
Room 119A – Kitchen	40.5	10	YES	
Room 118 – Storage	11.3	30	NO	
Room 116-2 – Storage	15.6	30	NO	
Room 117-2 – Boiler room	10.2	30	NO	
Room 115 – Storage	102.1	30	YES	
Room 115A – Storage	14.3	30	NO	
Room 112, 112A, 113		Inaccessible; off-limits		
Room 102B		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 Frederick

Bonus Environmental, LLC Work 989 To NGB 990 IA Reading Room May, 2018 P.O. Box 121 BESTAVALABLE 76894



NGB /Frederick Army National Guard Readiness Center	August 4, 2010
Project No. 1061-03	Page 7

Army National Guard Readiness Center located at 8501 Old National Pike in Frederick, 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

Bonus Environmental, LLC recommends that any areas of concerns outlined within this report be evaluated to ensure the necessary actions are made. Following the completion of the industrial hygiene evaluation, Bonus Environmental, LLC found the following safety and/or indoor air quality conditions of the facility to be within acceptable levels/condition in regards to the following:

- Carbon Dioxide
- Carbon Monoxide
- Presumed Asbestos Containing Materials
- Ergonomics
- Housekeeping

- Temperature
- Relative Humidity
- Lead Air Samples
- Water-damaged/Moldy Building Material

It has been a pleasure to be of assistance to you. Please contact us if you have any questions concerning this report or if we can be of any further assistance in any other environmental or occupational health matter.

Sincerely,



Principal Bonus Environmental, LLC

Non-Responsive	

Principal Bonus Environmental, LLC

Mt. Pleasant, MI 48804 FOIA Requested Record #1715-0085 (MD) com Released by National Guard Bureau Page 2917 of 5269

<u>Appendix A</u>

Shop Diagram



Front

Frederick Armory Evacuation Plan

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2919 of 5269

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<u>Appendix B</u>

Lead Sample Results

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	ne Air Blank Air Air Air Air Air Air Air Air Air Air Air Air Air	F-A-2FlameAirF-A-2FlameAirF-W-1FlameWipe BlankF-W-2FlameWipeF-W-3FlameWipeF-W-4FlameWipeF-W-5FlameWipeF-W-6FlameWipeF-W-6FlameWipeF-W-6FlameWipeF-W-6FlameWipeF-W-6FlameWipeF-W-9FlameWipeF-W-10FlameWipeF-W-11FlameWipeF-W-12FlameWipeF-W-13FlameWipeF-W-14FlameWipeF-W-15FlameWipe

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Page 2921 of 5269

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	507189 5/21/2010 5/28/2010	al Result	110 ug/fi^2 esults of quality of to paint chip, anager: G Edw anager: the public, ar
SIS	Chain Of Custody: Date Submitted: Person Submitting: Date Analyzed: is for Lead	Total ug Fin	 <12 15 16 16 a with these sampes. accreditation applies or accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accreditation accredita
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×	Job Na Job Lo Job Nu P.O. Ni Summ	Sample Type	Wipe Wipe Wipe Solids: EPA 600/F Solids: EPA 60 by weight mg g/L = parts per 1 herwise noted. igits shown igits shown igits shown dariby indicative of dariby
mental Laborator	eau ne, Attn: NGB-AVN-S vation aryland 21078	Analysis Type	Flame Flame Flame Paints, and Soil/So es, Paints, and Soil/So es, Paints, and Soil/So es, Paints, and Soil/So ts, Paints, and Soil/So miton (ppm) ing the result. I condition unless of tis. Any additional d ing the result. I condition unless of ing the result. I any blank results ing the result. I any blank results ing the result in the solution aboratory.
cialized Environ	National Guard Bur 301-IH Old Bay Lau State Military Reser Havre de Grace, Ma	Client Sample Number	F-W-17 F-W-18 F-W-18 r Flame: Air, Wipes, ir Furnace: Air, Wipe, e mg/Kg = par by weight ug = ere received in good de two significant digi dered when interpret are not corrected fo ind wipe samples arr nor verified by this li nor verified by this li are based upon the in ple material will be disc.
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AMA Analytical Services, Inc.

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QC Summary

Sample Delivery Group: 19396

Analysis Type: Flame Sample Type: Analysis Date:

Result

5/28/2010

Wipe

Percent

Recovery

Preparation Blank		-0.075	ρpm.			Accentable
Report Limit Verification Sample	-	0.272	 ррт	81.6%		- Accentable
Expected Spike Level (ppm)	0.3333	-				
Duplicate Sample 1			mg/Kg			· • · •
Duplicate Sample 2		•	mg/Kg		- ·	Accentable
Matrix Spike Analysis						- · · · · · · · · · · · · · · · · · · ·
Spiked Sample	-					Acceptable
Spike Duplicate		-				Accentable
Laboratory Control Sample 1			UP	102.01%		- Accentable
Laboratory Control Sample 2		287 202	4 <u>∼</u> s gu	103.06%	1.02%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999846

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			
507 18 9	47848	F-W-1			
507189	47849	F-W-2			
SDG Number: 19	396				Page 1 of 2

Samples included in this Sample Delivery Gros	p (SDG)
-----------------------------------------------	---------

Chain Of Custody	AMA Sample Number	Client Sample Number F-W-3	
507189	47850		
507189	47851	F-W-4	
507189	47852	F-W-5	
507189	47853	F-W-6	
507189	47854	F-W+7	
507189	47855	F-W-8	
507189	47856	F-W-9	
507189	47857	F-W-10	
507189	47858	F-W-11	
507189	47859	F-W-12	
507189	47860	F-W-13	
507189	47861	F-W-E4	
507189	47862	F-W-15	
507189	47863	E-W-th	
507189	47864	F-W-17	
507189	47865	F-W-18	
507190	47890	CL-W-21	
507190	47891	C1-W-22	

SDG Number: 192

19396

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Page 2 of 2

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2924 of 5269



AMA Analytical Services, Inc.

Focused on Results!!



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
- Results shall be reported via email to the following persons:
 - National Guard Subcontractor No a. @bonusenvironmental.com b. CIV NGB:
 - us.army.mil c. CIV NGB: rmy.mil
- 3) Hard Copy Reports & Invoices shall be nativied in the following manner: a. Original Invoices and Copies of Reports shall be sent to the National Guard National Guard Bureau Attn: Von-Re sponsive

301-In 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

<u>Attn:</u> No	n-Responsive
OFFIC	e: 989-779-7686
<u>(e11:</u>	989-621-3862

- 4) All Pb Wipes shall be handled in the following manner:
 - a. All samples shall be analyzed utilizing FLAA procedures
 - b. Samples whose results are reported as less than the reporting limit, and the reporting limit is greater than 40ug/ft2 shall be re-analyzed utilizing GFAA procedures.
- 5) All other samples Pb Paints, Soils, & Airs, PCM Airs, PLM Bulks, TEM Airs, & TEM Bulks shall be analyzed utilizing standard analytical procedures

Asbestos · Lead · Mold

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<u>Appendix C</u>

Photographs



NGB/ Army National Guard - Frederick Readiness Center Project No. 1061-03

August 4, 2010 Page 11



Building exterior, north side entrance



Room 114, former indoor firing range



Room 117, Boiler Room



Room 101, Drill Hall/Parade Floor



Room 119, Kitchen



Room 116, Storage Room

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August 4, 2010 Page 12



Building exterior, south side

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<u>Appendix D</u>

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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 Frederick Readiness Center

Prepared For:	National Guard Bureau Region North IH
	301-IH Old Bay Lane
	Havre de Grace, MD 21078
Survey Location:	Frederick Readiness Center
2	8501 Old National Pike
	Frederick MD, 21701
Prepared By:	Compliance Management International, Inc.
3 6 165	1215 Manor Drive
	Suite 205
	Mechanicsburg, PA 17055
Survey Date:	January 3, 2013
Report Date:	February 18, 2013



Manager, Industrial Hygiene Services

Table of Contents

Section 1.0 Executive Summary
Section 2.0 Operation Description & Observations
Section 3.0 Lead Testing
Section 4.0 Lighting
Section 5.0 Indoor Air Quality
Section 6.0 Suspect Asbestos Containing Building Materials
Section 7.0 Equipment 11
Section 8.0 Limitations
Appendix A. Laboratory Analysis Report
Appendix B. Photographs
Appendix C. Floor Plan
Appendix D. References

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on January 3, 2013, at the Frederick Readiness Center located at 8501 Old National Pike, Frederick, MD 21701. The survey was performed by Mr. Non-Responsive.

- 1. Lead bulk, surface and air samples were collected. Surface levels of lead exceeded 200 micrograms per square foot (ug/ft^2) in two locations. Cleaning procedures should be improved and remedial action should be taken to maintain lead levels below 200 ug/ft². See Section 3.0 for sampling results.
- 2. Lighting levels did not meet the American National Standard Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in 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. Relative humidity levels were less than the American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) recommended guideline of 30-60% in all locations.
 - b. Temperature levels were less than the ASHRAE recommended guideline of 68-79 degrees F at one location.

See Section 5.0 for detailed sampling results

- 4. Several conditions or factors that could affect indoor air quality were observed at the time of this survey. This includes:
 - a. Roof leaks and sources of water infiltration;
 - b. Dirty supply and return vents.
 - c. Some water damaged ceiling tiles as well as ceiling tiles with minimal fungal growth were at several locations in the facility.
Section 2.0 Operation Description & Observations

The Frederick Readiness Center is mainly an administrative facility with a drill hall, offices, classroom, and converted firing range/storage areas. There were approximately 4 full-time employees stationed at this facility at the time of this survey.

The building was initially constructed in 1982. The building is one story with a brick exterior. The interior walls are concrete block or drywall. The floors are concrete with vinyl floor tile or carpet.

The Heating, Ventilation, and Air-Conditioning (HVAC) system consisted of an oil-fired forced air furnace for heat and roof top units for air conditioning.

The area of the building that was once a firing range has been converted into a wall locker storage area. No firing range components remain. Wood has been placed on the floor covering the bullet trap.

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 properly designed. Personnel had supportive chairs.

Section 3.0 Lead Testing

Due to the age of the building there is a low potential for lead based paint to be present. Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 um mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Sample #	Location	Bulk	Air	Surface
•		(%)	ug/m°	ug/ft ⁻
1	Drill Hall	*	<6.7	*
2	Converted Firing Range – Storage Area	*	<6.6	*
3	Drill Hall – Center of Floor	*	*	<110
4	Drill Hall – Top of Coke Machine	*	*	270
5	Drill Hall – Top of Table	*	*	<110
6	Kitchen – Top or Refrigerator	*	*	<110
7	Kitchen – Top of Microwave	*	*	<110
8	Hallway – Outside Converted Firing Range	*	*	<110
9	Converted Indoor Firing Range – Concrete Floor	*	*	<110
10	Converted Indoor Firing Range – Wooden	*	*	340
10	Floor			540
11	Converted Indoor Firing Range – Top of Wall	*	*	<110
11	Locker			<110
12	Classroom – Break Room Top of Book Shelf	*	*	<110
13	Office 102A – Top of Deck	*	*	<110
14	Classroom/Weight Room Top of Desk	*	*	<110
15	Office 120 – Top of File Cabinet	*	*	<110
16	Office 106 Top of Table	*	*	<110
17	Blank- Wipe	*	*	<12 ug
18	Blank - Air	*	<3 ug	*
19	Paint Chip – Men's Bathroom Ceiling	< 0.011	*	*
20	Paint Chip – Kitchen Ceiling	< 0.01	*	*
-	Criteria	0.5	50	200

Lead Testing Results Summary

Table Notes:

- 1. Bolded results exceed listed criteria
- 2. **ppm** = parts per million
- 3. ug/ft^2 = micrograms per square foot
- 4. ug/m^3 = micrograms per cubic meter
- 5. **ug** = micrograms

Source: NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges

The National Guard Bureau currently utilizes 200 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/ft² on floors and 250 ug/ft² on windowsills should be observed. There is no child care provided at this facility.

Lead bulk, surface and air samples were collected. The following is a summary of the sample results from this survey.

- Surface levels of lead were above the recommended guideline of 200 ug/ft² in the following locations:
 - Drill Hall Top of Coke Machine
 - Converted Indoor Firing Range Top of Wooden Floor

Cleaning procedures should be improved to maintain lead levels on surfaces below the recommended guideline of 200 ug/ft^2 .

- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m³).
- Paint was observed to be peeling on ceilings in the kitchen and men's bathroom. A bulk samples were collected and determined to contain <0.001%Pb. This is less than the EPA definition of lead based paint = 0.5%. However, all areas of peeling paint should be repaired.

Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. K98364). The light meter was last calibrated in April 2012. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Location	Foot Candles	Recommended	Sufficient
	(FC)	Lighting (FC)	Lighting
Drill Hall	47.1	10	Yes
Office 111	63.3	30-50	Yes
Break Room 110A	56.4	10	Yes
Office 110B	108.3	30-50	Yes
Office 109	44.1	30-50	Yes
Office 107	67.0	30-50	Yes
Office 102A	41.1	30-50	Yes
Office 102B	56.1	30-50	Yes
Office 102	46.6	30-50	Yes
Men's Bathroom	78.1	5	Yes
Classroom/Weight Room	18.6	30-50	No
Office 120	25.5	30-50	Yes
Kitchen	58.3	50	Yes
Converted Firing			
Range/Storage	22.1	30	No

Light Survey Assessment Summary

Table Notes:

1. FC = Foot Candles

2. Bolded results did not meet listed criteria

Source: ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

The lighting level did not meet the minimum recommended guideline in the classroom/weight room and converted firing range/storage area. Lighting should be improved in these areas.

Section 5.0 Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, carbon monoxide and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7565 (Serial #02041015). The IAQ Meter was last calibrated in August 2012.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2010). ASHRAE specifies temperature and relative humidity ranges for human comfort (ASHRAE 55-2010). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60%.

The following table summarizes the measurements collected.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Office 111	59.2	26.2	542	0.0
Office 110B	69.3	21.1	800	0.0
Office 107	73.8	15.7	729	0.0
Outdoors	45.3	20.2	303	0.0
Criteria	68.0-79.0	30-60	<1,003	<9.0

IAQ	Assessment Summary
-----	---------------------------

Table Notes:

- 1. **Bolded** results exceed listed criteria
- 2. **ppm** = parts per million
- 3. (%) = percent relative humidity
- 4. \mathbf{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 and relative humidity levels were outside the recommended guidelines. We recommend that the temperature levels be maintained at 68-79 degrees F for comfort during occupied periods. Low relative humidity can cause the drying of the mucous tissues and an increased susceptibility to respiratory infection. Relative humidity should be maintained at 30-60%.

- Carbon dioxide levels measured did not exceed the recommended ceiling of 1,003 parts per million (ppm). This indicates that outdoor air ventilation is adequate in all areas.
- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm.
- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. The following observations were noted:
 - A roof leak and associated water damaged ceilings in the kitchen and men's bathroom. All sources of water infiltration should be identified and repaired. Water stained ceiling tile should be removed and replaced.
 - Overall housekeeping was adequate.
 - The HVAC supply grills located in some areas were dirty. These should be cleaned. Do not permit dirt, debris, microbial growth, etc. to accumulate in any portion of the HVAC system.
 - Approximately 10 water stained ceiling tiles were observed in the facility office areas.
 - Three ceiling tiles with minimal fungal growth were observed in the break room. The tiles should be carefully removed, placed in a plastic bag and disposed of.

Section 6.0 Suspect Asbestos Containing Building Materials

Based on the age of the building (e.g., constructed in 1982) it is unlikely asbestoscontaining materials (ACM) are present in the facility. It was reported that no asbestos containing materials were present in the facility. No suspect ACM was observed at the time of this survey. Inaccessible areas such as behind walls or crawlspaces were not inspected.

Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	02041015	8/2012	NA
Cal Light 400 Light Meter	K98364	4/2012	NA
TSI 4199 Calibrator	41460827002	8/2012	NA
SKC Air Sampling Pump	647631	1/2/2013	2.50 LPM
SKC Air Sampling Pump	647610	1/2/2013	2.47 LPM

Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

Appendix A. Laboratory Analysis Report

Appendix B. Photographs

Appendix C. Floor Plan

Appendix D. References

- 1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead
- 2. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values and Biological Exposure Indices, 2011 Edition
- 3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition
- 4. 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.



1720 Walton Road Blue Bell, PA 19422 610-828-3078 Fax 610-828-7842

February 9, 2009



Army National Guard ATTN: NGB-ARS-IHNE 301-IH Old Bay Lane Havre de Grace, MD 21078

Subject: Industrial Hygiene Assessment Report Fort Ritchie Readiness Center, Cascade, Maryland 21719 IES Project No. EHS08794.02

Dear Shirley:

IES Engineers (IES) is pleased to enclose the final report of the Industrial Hygiene assessment conducted at the Army National Guard Fort Ritchie Readiness Center facility located in Cascade, Maryland. Thank you for the opportunity to perform this assessment. Should you have any questions, please contact Non-Responsive or me.

Sincerely,



Senior Manager, Health, Safety & Industrial Hygiene Services

cc: Non-Responsive, IES



NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE HAVRE DE GRACE, MARYLAND

FINAL INDUSTRIAL HYGIENE ASSESSMENT FORT RITCHIE READINESS CENTER 13817 RITCHIE ROAD, CASCADE, MARYLAND, 21719 SURVEY DATE: JULY 16, 2008

IES PROJECT NO. EHS08794.02 REPORT DATE: FEBRUARY 9, 2009

Prepared and submitted by:

Non-Responsive /e/

Non-Responsive, CIH Senior Project Manager Certified Industrial Hygienist review by:

Non-Responsive /e/

Non-Responsive, CIH Senior Manager, Health, Safety & Industrial Hygiene Services



TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1.1 Introduction	1
1.2 Facility Description	2
1.3 Findings and Conclusions	3
1.4 Recommendations	5
OPERATION DESCRIPTION AND CONDITION	6
2.1 General Description and Condition	6
2.2 Specific Site Survey and Conditions	6
SAMPLE RESULTS AND MEASUREMENTS	7
3.1 Air Sampling	7
3.1.1 Indoor Air Quality	7
3.1.2 Airborne Lead Sampling	9
3.2 Lead Dust and Bulk Sampling	10
3.3 Illuminance Survey	12
ONSITE OBSERVATIONS	13
4.1 Physical Conditions of RC	13
4.2 Housekeeping	13
4.3 Ergonomics	13
EQUIPMENT AND CALIBRATION DATA	13
5.1 Sampling Equipment List	13
5.2 Sampling Equipment Calibration Data	14
REFERENCES	14
TABLES	
1 – Air Temperature, Relative Humidity, CO2 and CO Measurements	8
2 – Airborne Lead Sampling Results Summary	9
	EXECUTIVE SUMMARY 1.1 Introduction 1.2 Facility Description 1.3 Findings and Conclusions 1.4 Recommendations OPERATION DESCRIPTION AND CONDITION 2.1 General Description and Condition 2.2 Specific Site Survey and Conditions SAMPLE RESULTS AND MEASUREMENTS 3.1 Air Sampling 3.1.1 Indoor Air Quality 3.1.2 Airborne Lead Sampling 3.3 Illuminance Survey ONSITE OBSERVATIONS 4.1 Physical Conditions of RC 4.2 Housekeeping 4.3 Ergonomics EQUIPMENT AND CALIBRATION DATA 5.1 Sampling Equipment List 5.2 Sampling Equipment List 5.2 Sampling Equipment List 5.1 Sampling Equipment List 5.2 Sampling Equipment List 5.1 Air Temperature, Relative Humidity, CO ₂ and CO Measurements 2 – Airborne Lead Sampling Results Summary

Table 3 – Wipe/Bulk Sample Results Summary

11



TABLE OF CONTENTS (Cont'd)

Table 4 – Illuminance Readings Summary	
Table 5 – Sampling Equipment List	14
Table 6 – Sampling Equipment Calibration Data	
APPENDICES	
Appendix A – Readiness Center Photographs	
Appendix B –Indoor Air Quality Map	

- Appendix C Laboratory Analysis Results
- Appendix D Illuminance Readings Map



1.0 EXECUTIVE SUMMARY

1.1 Introduction

Assessment Date: July 16, 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 13817 Ritchie Road in Cascade, Maryland. The purpose of the Industrial Hygiene survey was to identify and measure the existence and extent of potentially hazardous operations or conditions at the ARNG facility. Mr. Non-Responsive, CIH, Senior Project Manager, of IES performed the assessment. All assessment activities were conducted with reference to the Statement of Work – Industrial Hygiene Services for National Guard Bureau Industrial Hygiene Region North Baseline Surveys for Readiness Centers and Administrative Buildings, May 2008. Assessment activities within the readiness center included:

- 1) Dust sampling and analysis for lead surface contamination,
- 2) Air sampling and analysis for lead (to determine administrative personnel exposure to airborne lead),
- 3) Bulk sampling of suspected asbestos-containing building materials, or lead-containing paint (where advised),
- 4) Physical (visual) site inspection of all internal building areas to note condition of materials, particularly those suspected to be lead or asbestos-containing, as well as potential water-damaged materials, housekeeping conditions and related safety hazards, ergonomic considerations, and indicators of indoor air quality,
- 5) Measurements of relative humidity, carbon dioxide and temperature in occupied areas of each floor, as well as lighting supporting evaluation with respect to indoor environmental standards,
- 6) Visual inspection and/or measurement of ventilation systems within the readiness center (general and local exhaust), as pertinent, supporting evaluation of indoor air quality and maintenance procedures,
- 7) Evaluation of attached garages, with respect to visual examination, hazards present, and observation/documentation of controls utilized including administrative, personal protective equipment and ventilation controls, and associated impact upon readiness center operations.

Conferred With: SSG Non-Responsive, Administrative Supervisor, Fort Ritchie Readiness Center



1.2 Facility Description

Fort Ritchie RC (also referred to as Edgar Boyd Armory), located at 13817 Ritchie Road, Cascade, Maryland is single-story training facility constructed in 1994. Standard working hours are from Tuesday through Friday, between the hours 0630 to 1700.

Predominant construction features include interior block masonry walls on concrete slab with brick exterior cladding, and insulated metal pan roof structure. Interior finishes included 12 inch square (12" x 12") floor tile, or masonry tile floors, suspended fiber acoustic ceiling tile (2' x 2'), and painted drywall partitions. There is no attached garage at the facility. All garage/maintenance activity is conducted through the facility located in conjunction with the Hagerstown Readiness Center, located in Hagerstown, Maryland. Minor vehicular checks, (fluid levels, tire pressure, etc.) are conducted in the vehicle storage/fueling/cleaning lot, located at rear of drill room, particularly on drill weekends. Occasionally, vehicles may be driven into the drill room area for loading, presumably during inclement weather. The drill room is composed of block walls, sealed concrete floor, and metal frame roof with Tectum-type insulation. The RC includes: drill room, converted parachute packing room (old firing range), kitchen/dining facility, exercise room, men's and women's locker rooms/toilets, supply storage area, arms vault, administrative office area, team drill/briefing rooms and exterior accessible boiler room, and flammable storage room. Refer to Appendix A of this report for current photographs of facility areas/conditions.

Heating, ventilation and air-conditioning (HVAC) service is achieved through various methods at the Fort Ritchie RC. Heating is achieved primarily by hot water boiler/circulating hot water heat delivered to perimeter unit ventilators, ceiling mounted space heaters (drill room and supply storage), and to roof-mounted package heating units (hallways, kitchen/dining facility, lockers). Separate package HVAC units are located within the supply storage area, serving the administrative offices, team offices and supply storage areas; however, cooling systems were found to be fouled or non-functional in these areas. Cooling is also achieved primarily by four perimeter unit ventilators located in the administrative offices section. An additional five unit ventilators are located within the area of caretakers office, exercise room and dining facility; however, these units do not properly operate in the cooling mode, and provide heating only. Other facility areas are cooled by natural ventilation (open doors and windows), or exhaust fans located within the drill room, kitchen, and locker rooms. A separate, fully-functional HVAC system is installed in the parachute room, which provides cooling. During the cooling season (summer months), natural ventilation is used throughout most of the facility.

This facility is occupied by two full-time administrative (active guard reserve) personnel (SSGs and Non-Responsive). Additionally, one full-time Caretaker (Caretaker (Caretaker (Caretaker Caretaker (Caretaker Caretaker Caretaker (Caretaker Caretaker Caretaker Caretaker Caretaker Caretaker (Caretaker Caretaker Caretaker Caretaker Caretaker Caretaker Caretaker Caretaker Caretaker (Caretaker Caretaker (Caretaker Caretaker Ca



1.3 Findings and Conclusions

The predominant findings and conclusions of the assessment at this location are as follows:

• The facility is relatively new, generally in good condition, with exception of heating, ventilating and air-conditioning systems, as discussed below.

HVAC Service

- Heating, ventilating and air-conditioning (HVAC) service was found to be largely nonfunctional at the site due to equipment malfunction, with unknown capability, or inaccessibility.
 - Five of nine unit ventilators were not able to supply cooling to areas served (caretaker's office, exercise room, dining facility).
 - All three HVAC systems located in the supply storage area (serving administrative offices, team offices and supply areas) were found non-functional or with limited function.
 - The unit serving team offices was apparently disconnected from service, and was found inaccessible due to razor/security wire atop lumber/wire partitions.
 - Other units were observed with heavily fouled cooling coils, inadequate filtration (not suitable for commercial use), broken filter panels, or reportedly unused due to frequent "freeze-up: of equipment.
 - Roof-mounted package units could not be inspected due to bee and wasp nests located in access panels of all units. The caretaker could not verify functionality of this equipment (whether heating and/or air-conditioning could be supplied by this equipment).
 - Localized oil-fired heaters were found located within the drill hall and supply storage.
 - A fully-functional HVAC system was found located within the parachute room.
 - Caretaker responsibility is limited to changing filters; however, a standard change schedule
 was not used. All roof top HVAC equipment were inaccessible for inspection on the date
 of the assessment due to bee and wasp nests within the access panels. This problem may
 impact indoor environmental quality by reducing access for service, and/or necessary and
 frequent use of insecticide in proximity within the equipment may contribute to increased
 insecticide exposure unless properly applied.
 - No annual HVAC service records were available on-site, and the HVAC servicer, assigned at Pikesville Unit "Garage 13" is not readily accessible for needed assistance.

Facility Condition

- Ceiling tiles were observed to be warped in team office and general hall areas (indication of excess moisture absorption); however, musty odor or visible mold growth was not readily observed during the survey.
- The exercise room was found to contain carpet on slab, with wall to wall rubber mat on carpet. This condition may lead to microbial growth, particularly during summer conditions with high relative humidity, or ineffective air exchange. General musty odor was present in the room, in addition to rubber odor. No cleaning/disinfection program was noted for the exercise equipment.



- All building materials present within the RC were found in good condition on the day of the Industrial Hygiene Assessment. IES did not find presumed asbestos-containing materials (PACM) to be present. Facility paint was found in good condition with the exception of a small section of delaminated paint located in the Women's locker room, due to a roof drain leak. The roof drain leak has since been repaired.
- The main supply storage area was observed with numerous personal packs/rucksacks, scattered within the storage area, limiting free access within the space.
- No boiler chemical treatment program was currently implemented.
- A small section of paint was found delaminated at the women's restroom, due to a prior-leaking roof drain. The roof drain has since been repaired.
- The parachute room (former firing range) did not have any evidence of prior firing range use, and was completely renovated.
- Live and dead insects were observed at various facility hallways and areas. Mouse droppings were found atop storage cabinets in the parachute space. The caretaker indicates that no pest control program is implemented; no support is provided for a pest control program.
- No maintenance garage was present; however, due to sealed concrete floor, vehicular traffic may be brought into the drill hall, perhaps during drill weekends for loading purposes. Idling vehicles with inadequate exhaust may contribute to build-up of exhaust emissions and CO within the building.

Security

• Facility security may be limited. The front door is propped open during summer months. The boiler room was found unlocked.

Other Ventilation

• The exhaust fans were found non-functional in the men's room locker area.

EH&S Compliance & Support

- Caretaker is provided cleaning chemicals and agents by order, through the Pikesville Armory; however, the caretaker may not be provided adequate functional materials needed, or limited quantities, leading to need for localized purchase of chemical products or materials. Material safety data sheets are not secured during these purchases.
- Current, up-to-date MSDS are not maintained on-site for chemical products used. Caretaker utilizes personal protection only to extent that such protection is voluntarily used (i.e. hearing



protectors or glove protection may be used during chemical use, though no particular glove types were specified for certain jobs).

- The average illuminance levels in several areas throughout the shop were below the recommended values. Although the lower-than-recommended lighting levels are not expected to present an imminent hazard, safety and ergonomic improvements could result from enhanced lighting in these areas.
- A separate flammable storage room was found located with outdoor access from the vehicle storage lot. The flammable storage room is used for other storage at present.
- An outdoor portable truck wash/recycling system was observed on-site, in addition to other hazardous material storage. System maintenance is managed by off-site personnel, and is not monitored by on-site personnel.

1.4 Recommendations

IES' recommendations resulting from this assessment, including the determination of the Risk Assessment Codes (RACs) exposures, are included in a separate document entitled, "Fort Ritchie_RC_08_Recommendations."



2.0 **OPERATION DESCRIPTION**

INSTALLATION: RC Army National Guard BUILDING: 13817 Ritchie Road, Cascade, Maryland, 21719 LOCATION: Facility-wide

2.1 General Description and Condition

OPERATION DESCRIPTION: No vehicle maintenance function is provided at the Fort Ritchie RC. The operations performed at this site are described in Section 1.2, Facility Description.

2.2 Specific Site Survey and Conditions

Various RC personnel provided assistance to Mr. Non-Responsive, Senior Project Manager of IES during and subsequent to the survey period, as coordinated by SSG Non-Responsive, Administrative Supervisor, of the Ft. Ritchie RC.

CHEMICAL AND PHYSICAL AGENTS SAMPLED: During the assessment, two personal samples for airborne lead were collected. All sample results were reported less than the adjusted OSHA Permissible Exposure Limit, time-weighted average (PEL-TWA) standard of $40 \,\mu g/m^3$ for a 10-hour work shift. 15 surface wipe samples were collected throughout the facility, at specified or suspect areas. None of the surfaces sampled were found to have contaminant levels exceeding the $200 \,\mu g/ft^2$ reference level for housekeeping.

Facility paint was generally found in good condition. One bulk sample collected from peeling paint in the Women's locker room was not considered lead-based paint. No presumed asbestos containing materials (PACM) were identified during the assessment.

General IAQ measurements (relative humidity, carbon dioxide, carbon monoxide and temperature) were made throughout the RC facility at 18 point locations. Refer to report sections 1.3 - Key Findings and Conclusions, and 3.0 - Sample Results and Measurements for details.

VENTILATION/ HEATING, VENTILATING & AIR-CONDITIONING (HVAC) SYSTEMS: Heating, ventilation and air-conditioning (HVAC) service is achieved through various methods at the Fort Ritchie RC. Heating is achieved primarily by hot water boiler/circulating hot water heat delivered to perimeter unit ventilators, ceiling mounted space heaters (drill room and supply storage), and to roof-mounted package heating units (hallways, kitchen/dining facility, lockers). Separate package HVAC units are located within the supply storage area, serving the administrative offices, team offices and supply storage areas; however, cooling systems were found to be fouled or non-functional in these areas. Cooling is also achieved primarily by four perimeter unit ventilators located in the administrative offices section. An additional five unit ventilators are located within the area of caretakers office, exercise room and dining facility; however, these units do not properly operate in the cooling mode, and provide heating only. Other facility areas are cooled by natural



ventilation (open doors and windows), or exhaust fans located within the drill room, kitchen, and locker rooms. A separate, fully-functional HVAC system is installed in the parachute room, which provides cooling. During the cooling season (summer months), natural ventilation is used throughout most of the facility.

LIGHTING: The average luminance levels were collected throughout the facility, with certain locations found with illuminance levels less than ARNG recommended standards. Refer to Section 3.2 for a summary of the lighting measurements, and for identification of the deficient lighting levels.

WATER DAMAGE: Ceiling tiles were observed to be warped in team office and general hall areas (indication of excess moisture absorption); however, musty odor or visible mold growth was not readily observed during the survey. The exercise room was found to contain carpet on slab, with wall to wall rubber mat on carpet. This condition may lead to microbial growth, particularly during summer conditions with high relative humidity, or ineffective air exchange. General musty odor was present in the room, in addition to rubber odor. No cleaning/disinfection program was noted for the exercise equipment. Facility paint was found in good condition with the exception of a small section of delaminated paint located in the Women's locker, due to a roof drain leak. The roof drain leak has since been repaired.

HOUSEKEEPING: Live and dead insects were observed at various facility hallways and areas. Mouse droppings were found atop storage cabinets in the parachute space. The caretaker indicates that no pest control program is implemented; no support is provided for a pest control program. Current MSDSs were not found readily accessible on-site for the Caretaker and within readiness center operations.

ERGONOMICS: No inherent ergonomic hazards were noted during the survey.

A copy of IES' field notes from this assessment is included in a separate document entitled, "Ft. Ritchie_RC_08_Field_Notes." Please also refer to the determination of the Risk Assessment Code (RAC) for occupational exposures, included in the separate document entitled, "Ft. Ritchie_RC_08_Recommendations."

3.0 SAMPLE RESULTS AND MEASUREMENTS

3.1 Air Sampling

3.1.1 Indoor Air Quality

Measurements of air temperature, relative humidity, carbon dioxide (CO₂), and carbon monoxide (CO) concentrations were collected using a calibrated direct reading hand-held TSI Q-Trak indoor air quality monitoring instrument. The carbon monoxide sample results were compared with the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values



(TLVs) for exposure assessment purposes. TLVs are established through a peer review process, and are published annually in ACGIH's *TLVs and BEIs* booklet. The TLV's represent airborne exposure concentrations and conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. Due to wide variations in individual susceptibility, a small percentage of workers may experience discomfort or be affected by certain substances at concentrations below the recommended threshold limit.⁽¹⁾

Refer to Table 1 below for details of measured air temperature, relative humidity, CO₂, and CO collected throughout the building during the assessment.

Refer to Appendix B - Indoor Air Quality Sample Location Maps for the IAQ measurement locations throughout the facility.

TABLE 1AIR TEMPERATURE, RELATIVE HUMIDITY, CO2, AND CO MEASUREMENTS

Location:Ft. Ritchie National Guard RC (Edgar Boyd Armory), Cascade, MarylandDate:July 16, 2008

Sample						Relative
Location		Sample	CO ₂	CO	Temperature	Humidity
ID	Sample Location/Description	Time	(ppm)	(ppm)	(°F)	(%RH)
Q1	Outdoors (A.M.) - Entry sidewalk to Armory	0930	350	1.1	84	48
Q2	Operations Room – Central Area, occupied	0940	640*	0.4	81	43.3
Q3	Team Equip Storage – Locker area	1025	485	0.0	77	60***
Q4	Storage, Aisle - Adjacent to Team Equip. Storage	1030	470	0.4	77	52
Q5	Caretaker's Office - Central, occupied	1040	804*	0.6	78	51
Q6	Exercise Room – Central	1045	410	0.9	76	53
Q7	Electrical Room – Central	1050	381	0.8	78	44
Q8	Dining facility – Central	1055	455	0.1	77	45
Q9	Parachute Room, near HVAC unit	1100	373	0.4	74	40
Q10	Drill Room – Central	1115	463	0.0	77	45
Q11	Storage, Aisle - Adjacent to Team Equip. Storage	1130	405	0.3	78	42
Q12	Boiler Room - Central	1145	450	0.5	81	43
Q13	Roof, near access from Elec. Room	1330	414	1.3	93	25**
Q14	Caretaker's Office - Central	1630	476	0.4	78	51
Q15	Dining facility – Central	1640	410	0.9	76	53
Q16	Parachute Room – Central	1650	388	0.7	77	42
Q17	Drill Room - Central	1700	394	0.6	78	48
Q18	Orderly Room - Central, occupied	1710	653	0.1	77	54

Notes: *Carbon dioxide readings are likely influenced by exhalation of surveyor.

** Radiant heat from roof likely to reduce relative humidity in survey area.

*** Relative humidity levels exceeding 60% may contribute to bioaerosol amplification.

TABLE FOOTNOTES

Measurement device:

All measurements collected in real-time using a TSI Q-Trak indoor air quality monitor, at approximately 4 feet above ground/floor height. Parts per million contaminant in air. All CO₂ and CO concentrations expressed in ppm.

ppm



<u>Exposure Guidelines</u>	
CO ₂	Indoor CO ₂ concentrations should be maintained at less than 700 ppm above outdoor air
	levels – (ASHRAE 62.1-2007) ⁽²⁾
CO	50 ppm (OSHA PEL-TWA); 25 ppm (ACGIH TLV-TWA)
Temperature	68 °F to 79 °F (ASHRAE 55-2004) ⁽³⁾
Relative Humidity	30% to 60% (ASHRAE 55-2004) ⁽³⁾

3.1.2 Airborne Lead Sampling

Air sampling and analysis for lead were conducted with reference to the National Institute for Occupational Safety and Health (NIOSH) Method 7903 – Elements, by Ion Chromatography (IC).

Air samples were collected using constant flow, personal air sampling pumps on closed face 37-mm (0.8- μ m pore size) mixed cellulose ester (MCE) membrane filters mounted in two-piece cassettes. All sampling pumps were calibrated before and after the sampling period with media in-line, using a primary gas flow standard per method requirements. Following the survey, the air samples and a field blanks were collected and shipped via overnight courier to AMA Analytical Services, Inc (AMA) in Lanham, Maryland, which is accredited by the American Industrial Hygiene Association (AIHA) for lead analysis. All air sample results were reported in micrograms of lead cubic meters of air sample (μ g/m³) for comparison with applicable standards of this assessment.

A summary of analysis results are presented in Table 2 below.

Refer to Appendix C for the complete laboratory analysis results. Worksite Sampling Data Records are included in a separate document entitled, "Ft. Ritchie_RC_08_Medical."

TABLE 2 AIRBORNE LEAD SAMPLING RESULTS SUMMARY

Location: Date: Ft. Ritchie National Guard RC (Edgar Boyd Armory), Cascade, Maryland July 16, 2008

					Sample	Flow	Air	Lead Sample
Sample	Equipment		Start	End	Time	Rate	Volume	Result
ID	ID	Sample Description	Time	Time	(Minutes)	(lpm)	(L)	(mg/m3)
FR-01	IES-105	SSG Non-Responsive – Personal Breathing	0825	1201	396	1.99	788	< 0.0038
		Zone Sample; during routine administrative	1400	1700				
		duties within the Ft. Ritchie Armory.						
FR-02	IES-BFE-	SSG Non-Responsive – Personal Breathing	0827	1202	216*	1.97	425	< 0.0071
	1272-96	Zone Sample, During routine administrative						
		duties within the Ft. Ritchie Armory.						

* SSG Deprenda left the facility at 1200 hours for other detail and/or personal business.

TABLE FOOTNOTES

Measurement device:MSA ELF Escort constant flow air sampling pump, with 37mm, 0.8-µm MCE filter mediaMg/m3Milligrams per cubic meter air. Sample results expressed in milligrams contaminant per cubic meter of air.



Occupational Exposure Limits	 OSHA Permissible Exposure Limit, 8-hour time-weighted average (PEL-TWA) = 0.05 mg/m³; OSHA Action Limit-TWA = 0.03 mg/m³ NOTE: Due to workshift duration of 10 hours, all sample results must be interpreted in relation to an adjusted OSHA PEL-TWA of 40 μg/m³. Refer to the OSHA Lead Standard at 29 CFR 1910.1025 for details of the OSHA compliance requirements. ACGIH TLV-TWA= 0.05 mg/m³
---------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Refer to Section 5.0, Equipment and Calibration Data, for calibration data of equipment used during this assessment.

3.2 Lead Dust and Bulk Sampling

IES performed wipe sampling in the Drill Hall, Parachute Room (prior firing range), and in select areas throughout the facility, per the National Guard Bureau – Statement of Work requirements for Industrial Hygiene Services. All wipe sampling was performed in accordance with: best Industrial Hygiene practices and the guidelines published in Section II: Chapter 2, Sampling for Surface Contamination, of the OSHA Technical Manual. The wipe samples were collected over 100 square centimeter areas using pre-wetted Ghost Wipes (Environmental Express). The wipe samples collected as a part of this assessment, along with appropriate field blanks, were shipped to AMA for analysis and were analyzed using the NIOSH 7082 flame atomic absorption spectrophotometer (FAAS) method. All wipe sample results were reported in micrograms of lead per square foot of surface sampled (μ g/ft²) for the purposes of this assessment, and for subsequent comparison with OSHA guideline criteria of 200 μ g/ft².

One bulk sample was collected from a portion of the delaminated paint located in the Women's locker room. This paint sample was determined to be not lead based paint.

A summary of analysis results are presented in Table 3 below. Refer to Appendix C for the complete laboratory analysis results.



TABLE 3 – WIPE/BULK SAMPLE RESULTS SUMMARY

Location: Ft. Ritchie National Guard RC (Edgar Boyd Armory), Cascade, Maryland Date: July 16, 2008

Sample		Surface	Lead Surface
ID	Location	Area Sampled	Concentration (ug/ft ²)
FR-W01	Supply Room HVAC unit, evaporator side of drain pan	100 cm^2	110
FR-W02	Supply Room HVAC unit, bulk dust from filter	Bulk	590 mg/kg,
		- "	<1%
FR-W03	Supply Room HVAC unit, condenser side cooling coil	Bulk	100 mg/kg,
ED MOS		100 2	<1%
FR-W05	Roof, abandoned exhaust vent (old firing range)	100 cm ²	< 110
FR-W06	Executive Officer's office (Rm 115), top of door frame	100 cm^2	< 110
FR-W07	Administrative Office, top of pipe cover to unit ventilator	100 cm^2	< 110
FR-W08	Team Briefing Room (Rm 108), supply vent from non-functional HVAC in supply storage	100 cm^2	< 110
FR-W09	Armory Entry Lobby, top of hot water heat/floor radiator cover	100 cm^2	< 110
FR-W10	Exercise Room, return side intake of unit ventilator	100 cm^2	< 110
FR-W11	Dining facility, supply vent ribs of unit ventilator	100 cm^2	< 110
FR-W12	Kitchen, ceiling supply vent composite	100 cm^2	< 110
FR-W13	Parachute Packing Room (Old Firing Range), HVAC return vent opening	100 cm^2	130
FR-W14	Parachute Packing Room (Old Firing Range), top of storage cabinet, HVAC end	100 cm^2	< 110
FR-W15	Drill Room, top of emergency light, wall separating Parachute Packing Room	100 cm^2	< 110
FR-W16	Drill Room, chair storage room, door vent	100 cm^2	130*
FR-W17	Drill Room, top of personnel lockers (composite), nearest wall separating supply storage	100 cm^2	140*
FR-W18	Supply Storage Area, top of fluorescent light fixture, central aisleway	100 cm^2	< 110
FR-W19	Orderly Room (Administrative Office Block), ceiling supply vent composite	100 cm^2	< 110

BULK SAMPLE ANALYSIS RESULTS (%Pb)

FR-W04 Women's RR/Locker, peeling paint @ previous roof drain leak

chip < 1% Pb

* Trace contamination likely due to military personnel bringing lead contamination into building from outdoors, and/or stored on equipment

TABLE FOOTNOTES

Collection	Wipe sample collected with nitrile glove donned on hand, using "Ghost Wipe" towlette, by sequential wipe using
procedure:	template or best estimate of 100 cm ² area; multiple passes with clean surface of wipe and subsequent folding, and
	placement to a labeled, sealed plastic vial or bag.
ug/ft2:	Micrograms lead per square foot. Note: laboratory converts result from ug/100 cm2 to ug/ft2, prior to reporting.
< 1% Pb	Less than 1% lead detected in sample results.
OSHA	The USDOL/OSHA does not have a promulgated standard for lead surface contamination; however, OSHA has
guideline	provided an interpretive level of 200 ug/ft ² to assess the housekeeping requirement of "as free as reasonably
standard for	practicable". This interpretation is presented in OSHA Industrial Hygiene Technical Manual (TED 01-00-0150;
surface	1/20/1999), and in a letter of interpretation dated 01/13/2003, and subsequently issued into public domain.
contamination	
by lead	



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.⁽⁴⁾ All measurements were made in slow response mode and were expressed in foot candles (fc). The measurements were used to calculate average illuminance levels for each workspace.

Based on the activities conducted in each workspace, the calculated average illuminance level was compared to the ARNG recommended illuminance values.

A table of illuminance measurements is presented in Table 4 below. The data reported in this table represent the average illuminance readings from the accessible locations of the commonly occupied work areas of the facility.

Refer to Appendix D – Illuminance Readings Map for sample locations.

TABLE 4 ILLUMINANCE READINGS SUMMARY

Location:Ft. Ritchie National Guard RC (Edgar Boyd Armory), Cascade, MarylandDate:July 16, 2008

Sample ID	Sample Description	Average Illuminance Measurements (fc)	ARNG Recommended Illuminance Value (fc)
I1	Orderly Room (Administrative Office Block), central, on table	60	30-50
I2	Sgi ^{ontecome} Office, central, table height	25	30-50
I3	Aisleway adjacent to Operations Rooms, outside Room 108	12	5
I4	Operations Briefing Room, central	75	30-50
15	Team Briefing Room (Room 108), central	47	30-50
I6	Supply Storage Area, aiselway outside caged storage areas	2.4	5
I7	Main Supply Store Room, central, table height	4	30
I8	Caretaker's Office, central, table height	48	30-50
I9	Exercise Room, central, table height	65	30
I10	Dining facility, central, table height	55	10
I11	Kitchen, central, table height, not currently used for group cooking	94	50
I12	Electrical Room, central, near access to roof	14	30
I13	Parachute Packing Room (Old Firing Range), front-HVAC end, table height	47	140 (inspect)
I14	Drill Hall (Assembly Area), central, 1/2 overhead lighting "on"	9.3	10
I15	Drill Hall (Assembly Area), central full overhead lighting "on"	12	10
I16	Boiler Room, central, approximate table height	24	30
I17	Parachute Packing Room (Old Firing Range), central-main entry, table height	15	140 (inspect)

Notes: All illuminance measurements and recommended values are expressed in foot candles (fc)



4.0 ONSITE OBSERVATIONS

A copy of IES' field notes from this assessment is included in a separate document entitled, "Fort Ritchie_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 did not find presumed asbestos-containing materials (PACM) at this facility. Generally, paint was found in good condition with exception of certain floor areas (storage room), slight delamination with Women's RR, and exterior vehicle storage lot, environmental storage buildings. IES observed one small section of ceiling in the Operations area hall, with apparent mold staining associated with a prior repaired roof leak.

Separately, the condenser side cooling coils of the HVAC equipment located in the supply storage room, nearest Supply Seargent's Office was found in fouled condition. This condition should be corrected prior to returning the HVAC equipment to service.

4.2 Housekeeping

Housekeeping within the facility was found generally good. IES observed no imminent slip, trip and fall hazards on the day of the assessment, with the exception of findings previously noted for the main supply storage room. All walking surfaces were clear of hazards and objects above the head were secured safely to the wall or columns to reduce the risk of head injuries.

Outdoor environmental storage locations were observed; however, site personnel are not assigned responsibility to observe or maintain condition.

4.3 Ergonomics

No observations of work practices with inherent ergonomic hazards were noted during the survey; however, certain postural/work conditions may be anticipated in the parachute packing/repair operations. These operations are conducted primarily during or associated with drill weekends.

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	Equipment
		Number	Identification
Personal Sampling Pump	MSA Escort ELF	IES-105	IES-105
Personal Sampling Pump	MSA Escort ELF	BFE-1272-96	IES-BFE-1272-96
Bios Dry Cal Calibrator	Bios DCL-MH	101784	101784
Light Meter	International Light, IL1400A, illum. probe	3206/1782	R2373/3691
Indoor Air Quality Monitor	TSI Model 8554 Q-Trak	02071015	R10120
Velocity Meter	TSI Velocicheck, 8340	00100195	00100195

5.2 Sampling Equipment Calibration Data

Table 6 details the calibration data for each piece of sampling equipment used during the assessment.

TABLE 6SAMPLING EQUIPMENT CALIBRATION DATA

Equipment ID	Calibrator Used	Date of Pre- Sampling Calibration	Pre- Sampling Calibration Value (lpm)	Date of Post- Sampling Calibration	Post- Sampling Calibration Value (lpm)	Average Calibration Value (lpm)
IES-105	101784	7/16/08	2.02	7/16/08	1.96	1.99
IES-BFE-1272-96	101784	7/16/08	1.98	7/16/08	1.96	1.97

6.0 **REFERENCES**

- 1. ACGIH, 2008 TLVs and BEIs.
- 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, Refrigerating, and Air Conditioning Engineers (ASHRAE), Standard 55-2004, "Thermal Environmental Conditions for Human Occupancy," ASHRAE, Atlanta, Georgia, 2004.
- 4. "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," ARNG, 17 November 2007.
- 5. Occupational Safety and Health Administration, 29 CFR 1910.1025, Lead.



APPENDIX A

READINESS CENTER PHOTOGRAPHS

Posted to NGB and BarBau 794 EHS08 52.02 Ft Richie RC Final Report Rented Record # 1500.85 (MD) May, 2018 Released by National Guard Bureau Page 2968 of 5269





Photograph #1 – RC General Construction Features, Indoors, on careful inspection-ceiling tile warpage due to ambient humidity





Photograph #2 – RC Dining facility Unit Ventilator



Photograph #3 – Parachute Packing Room (Converted Firing Range)





Photograph #4 – Parachute Packing Room, new HVAC system



Photograph #5 – Minor Paint Delamination in Women's RR, prior roof drain leak





Photograph #6 – Exercise Room, rubber mat on carpet



Photograph #7 – Prior Roof Drain Leak – Operations Area




Photograph #8 – Supply Storage Room, ineffective storage-housekeeping



Photograph #9 – Supply Storage Area, inaccessible HVAC equipment





Photograph #10 – Package Unit on Build-up Roof



Photographs #11,12 – Prolific wasp nests in HVAC access panels & Kitchen exhaust ventilators

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Photograph #13 – Vehicle Storage Lot, wash recycle system



Photograph #14 – Vehicle Storage Lot, Environmental Storage, Flammable Storage Room at main building to right, used also for mower/equipment storage

Posted to NGB ERIAR Offing BarBau 794 EHS08 54.02 Ft Richie RC Final Report At Render Record #1500.85 (MD) May, 2018 Released by National Guard Bureau Page 2975 of 5269





Photographs #15,16 – Boiler Rm, boiler and hot water heater

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APPENDIX B

INDOOR AIR QUALITY MAP

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APPENDIX C

LABORATORY ANALYSIS RESULTS

Posted to NGB FOLA Required Bureau 794 EHS08794.02 Ft Ritchie RC Final Report Required Record #R-1500285 (MD) May, 2018 Released by National Guard Bureau Page 2979 of 5269

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Summary of Atomic Absorption Analysis for Lead

Page 1 of 1

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Rep L	orting .imit	Final Re	sult	Comments
0875728	FR-W01	Flame	Wipe	****	0.108	111.52	ug/ft²	110	ug/ft²	880) 81 - J
0875729	FR-W02	Flame	Soil/Solid	****	N/A	201.34	mg/Kg	590	mg/Kg	Insufficient sample was submitted to meet recommended reporting limits.
0875730	FR-W03	Flame	Soil/Solid	****	N/A	30.76	mg/Kg	100	mg/Kg	
Analysis Method fo Analysis Method F	or Flame: Air, Wipes, or Furnace: Air, Wip	Paints, and Soil/Sol es, Paints, and Soil/	lids: EPA 600/R-93/2 Solids : EPA 600/R-	200(M)-7420; Wate 93/200(M)-7421; V	r: SM-3111B Vater: SM-3113B	See QC associate NY ELAI	Summary for a ed with these s P accrediation	analytical result sampes. applies only to	ts of quality	control 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

samples.

Analyst: Melissa Sampson

Technical Manager: G Edward Carney

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. 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. All rights reserved. AMA Analytical Services, Inc.

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Summary of Atomic Absorption Analysis for Lead

Page 1 of 1

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Rep L	orting .imit	Final Re	sult	Comments
0875728	FR-W01	Flame	Wipe	****	0.108	111.52	ug/ft²	110	ug/ft²	990 (19)
0875729	FR-W02	Flame	Soil/Solid	****	N/A	201.34	mg/Kg	590	mg/Kg	Insufficient sample was submitted to meet recommended reporting limits.
0875730	FR-W03	Flame	Soil/Solid	****	N/A	30.76	mg/Kg	100	mg/Kg	
Analysis Method fo Analysis Method F	or Flame: Air, Wipes, or Furnace: Air, Wipe	Paints, and Soil/Sol es, Paints, and Soil/	lids: EPA 600/R-93/2 Solids : EPA 600/R-	200(M)-7420; Wate 93/200(M)-7421; \	r: SM-3111B Water: SM-3113B	See QC associat NY ELAI	Summary for a ed with these s P accrediation	analytical result sampes. applies only to	paint chip, v	control samples wipe, and water

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

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Air and Wipe results are not corrected for any blank results

samples.

Analyst: Melissa Sampson

Technical Manager: G Edward Carney

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Posted to NGB FOIA Reading Room <u>An ATTA (#100470) NT AP (101BEST/AVAILABLEICOP#10920) Accredited Laboratory</u> FOIA Requested Record #J-15-0085 (MD) May, 2018 4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643 Released by National Guard Bureau Page 2982 of 5269

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A Specialized Environmental Laboratory

CEREFINIATE OF ANALYSIS

Client:	National Guard Bureau	Job Name:	Natl Guard Bureau	Chain Of Custody:	503007		
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Ft. Richie MD	Date Submitted:	7/31/2008 Non-Responsive		NY ELAP 10920
	Havre de Grace, Maryland 21078	Job Number:	EHS 08794.02	Person Submitting:			
		P.O. Number:	Not Provided	Date Analyzed:	8/1/2008	Report Date:	8/1/2008



Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

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AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Repo	orting mít	I	'inal Res	ult	Comments
								- ::			·····,
0874216	FR-01	Flame	Air	788	N/A	3.81	ug/m³	<	3.8	ug/m³	
0874217	FR-02	Flame	Air	424	N/A	7.08	ug/m³	<	7.1	ug/m'	
0874218	FR-03	Flame	Air Blank	0	N/A	3.00	ug/m²	<	3	ug	
0874219	FR-W04(Paint)	Flame	Paint Chip	****	N/A	0.01	%Pb	<	0.01	%Pb	
0874220	FR-W05	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874221	FR-W06	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/fl²	
0874222	FR-W07	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874223	FR-W08	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874224	FR-W09	Flame	Wipe	****	0.108	111.52	ug/fit²	<	110	ug/ft²	
0874225	FR-W10	Flame	Wipe	****	0.108	111.52	ug/ft ²	4	110	ug/ft²	6.
0874226	FR-W11	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874227	FR-W12	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874228	FR-W13	Flame	Wipe	****	0.108	111.52	ug/ft ²		130	ug/ft²	
0874229	FR-W14	Flame	Wipe	****	0.108	111.52	ug/fl²	<	110	ug/ff²	
0874230	FR-W15	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft ²	
0874231	FR-W16	Flame	Wipe	****	0.108	111.52	ug/ft²		130	ug/ft²	
0874232	FR-W17	Flame	Wipe	****	0.108	111.52	ug/ft²		140	ug/ft	
0874233	FR-W18	Flame	Wipe	****	0,108	111.52	ug/ft²	<	110	ug/ft²	
0874234	FR-W19	Flame	Wipe	****	0.108	111.52	ue/ft²	<	110	ug/ft2	

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Posted to NGB FOIA Reading RoomAn AIHA (#100470), NVLAP (#5674,&/ABAPAY (#10920) Accredited Law // A Geguested Record #J-15-0085 (MD) May, 2018 4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643 Page 2984 of 5269 Page 2984 of 5269

AMA Analytical Services, Inc.



A Specialized Environmental Laboratory

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

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Chants	National Quart Pursey	Job Namar	Natl Guard Bureau	Chain Of Castody-	503007		100470
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Address:	301-JH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Ft. Richie MD	Date Submitted:	7/31/2008		10920
	Havre de Grace, Maryland 21078	Job Number:	EHS 08794.02	Person Submitting:	Non-Responsive		
		P.O. Number:	Not Provided	Date Analyzed:	8/1/2008	Report Date:	8/1/2008
Attention:	Non-Responsive						

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

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AMA Sample	Client Sample	Analysis Type	Sample Type	Air Volume	Area Wiped	Reporting	Final Result	Comments	
Number	Number			(L)	(ft²)	Limit		-	
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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 accrediation applies only to paint chip, wipe, and water samples.

Analyst: Melissa Sampson

Technical Manager: G Edward Carney

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APPENDIX D

ILLUMINANCE READING MAP

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National Guard Region North

National Guard Readiness Center Industrial Hygiene Evaluation Fort Ritchie Army National Guard Armory Cascade, MD 21719-9645

Prepared for:

National Guard Region North Industrial Hygiene Office 301 Old Bay Lane Havre De Grace, MD 21078

Attn:

n-Responsive

Prepared by:

Bonus Environmental, LLC P.O. Box 121 Mt. Pleasant, Michigan 48804

> Project No. 1061-03 August 21, 2010

Bonus Environmental, LLC

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TABLE OF CONTENTS

1.	EXE	CUTIVE SUMMARY	1
2.	LEA	D SAMPLING	2
	2.1	Lead Wipe Sampling	2
	2.2	Lead Air Sampling	3
3.	PHY	SICAL CONDITION OF FACILITY / PERSONNEL CONCERS	4
	3.1	Lead Based Paint	4
	3.2	Presumed Asbestos Containing Materials	4
	3.3	Water Damage/Mold Growth	4
	3.4	Housekeeping	4
	3.5	Employee Interviews	5
	3.6	Indoor Air Quality	5
4.	LIG	HTING SURVEY	6
5.	COI	NCLUSION	7

APPENDICES

Appendix A	Shop Diagram
Appendix B	Lead Sample Results
Appendix C	Photographs
Appendix D	References



August 21, 2010 Project No. 1061-03

National Guard Region North Industrial Hygiene Office 301 Old Bay Lane Havre De Grace, MD 21078-4003

Attn: Non-Responsive

Project: Army National Guard Readiness Center, Industrial Hygiene Evaluation Fort Ritchie 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 Fort Ritchie Army National Guard Readiness Center located at 13817 Ritchie Road in Cascade, 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 representativeNon-Responsive on May 20, 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 Fort Ritchie Readiness Center is an Army National Guard armory comprised of offices, a drill hall, a kitchen, conference rooms, storage rooms, a boiler room, a fitness room, a former indoor firing range, and classrooms. The point of contact for this facility was MSGT Non-Responsive. Five (5) full-time administrative personnel (plus one (1) recruiter and one (1) caretaker) are employed in the approximately 18,400 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

P.O. Box 121 BESTAVALABLE 76894 hygiene evaluation were sent to the National Guard Bureau Region North Industrial Hygiene Office approved laboratories for analysis.

2.0 – LEAD SAMPLING

2.1 – Lead Wipe Sampling

Lead wipe sampling was performed according to the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame). Twenty (20) wipe samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. The National Guard Bureau Region North Industrial Hygiene Office has established/interpreted a threshold of 200 μ g/ft² of lead concentration for surface cleanliness. The following table outlines the locations and analytical results for the lead wipe samples collected during this project

		Army National Guard – Fort Ritchie Readiness Cente Lead Wipe Sample Results	er	
Sample #	Sample Date	Sample Location	Sample Area (ft ²)	Sample Result (µg/ft²)
FR-W-1	5-20-10	Field Blank		< 12
FR-W-2	5-20-10	Drill hall, along west wall, Internet access point keyboard	0.111	< 110
FR-W-3	5-20-10	Drill hall, SW corner, surface of recruiting supplies table	0.111	< 110
FR-W-4	5-20-10	Drill hall, along east wall, top of locker	0.111	110
FR-W-5	5-20-10	Drill hall, along north wall, top of spill kit	0.111	< 110
FR-W-6	5-20-10	Drill hall, floor, center of room	0.111	< 110
FR-W-7	5-20-10	Room 129 (former indoor firing range), west side-center, light fixture	0.111	< 110
FR-W-8	5-20-10	Room 129 (former indoor firing range), NW corner of room, top of locker	0.111	< 110
FR-W-9	5-20-10	Room 129 (former indoor firing range), floor, center of room	0.111	< 110
FR-W-10	5-20-10	Hallway outside of room 129, east wall, top of fire extinguisher case	0.111	< 110
FR-W-11	5-20-10	HVAC unit, south side of roof, fan side	0.111	< 110
FR-W-12	5-20-10	HVAC unit, south side of roof, filter side	0.111	< 110
FR-W-13	5-20-10	Room 134, kitchen, top of Univex M20 mixing machine	0.111	< 110
FR-W-14	5-20-10	Boiler room, along south wall, top of indicator panel box	0.111	< 110
FR-W-15	5-20-10	Supply room, center of room, surface of storage shelf	0.111	< 110
FR-W-16	5-20-10	Room 113, supplied-air grill	0.111	< 110
FR-W-17	5-20-10	Room 138, fitness room, SE corner window sill	0.111	< 110

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NGB / Fort Ritchie Army National Guard Readiness Center Project No. 1061-03

August 21, 2010 Page 3

		Army National Guard – Fort Ritchie Readiness Cente Lead Wipe Sample Results	er	
Sample #	Sample Date	Sample Location	Sample Area (ft ²)	Sample Result (µg/ft²)
FR-W-18	5-20-10	Room 136, SE corner, top of heating register	0.111	< 110
FR-W-19	5-20-10	Lobby, top of display case	0.111	< 110
FR-W-20	5-20-10	Room 118, copy room, top of copy machine	0.111	< 110
FR-W-21	5-20-10	Room 132, top of transformer box	0.111	< 110

Surface cleanliness threshold = $< 200 \ \mu g/ft^2$

2.2 – Lead Air Sampling

The purpose of lead air monitoring was to document task-specific activities and corresponding exposures to lead. Occupational Safety and Health Administration (OSHA) 29 CFR 1926.62 requires employers whose employees are exposed to lead in the work place, in any quantity, make a determination whether any employee's exposure exceeds the action level (AL) of 30 μ g/m³ or the maximum permissible exposure limit (PEL) of 50 μ g/m³ as 8-hour time weighted averages (TWAs). If employee exposures are less than 30 μ g/m³, 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.

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NGB / Fort Ritchie Army National Guard Readiness Center Project No. 1061-03

		– Army National Guard Lead Air	Fort R Sampl	litchie I e Resul	Readine Its	ess Cen	ter		
Sample #	Sample Type	Sample Location	Flow Rate	Start	Stop	Vol.	Reprt. Limit (μg/m³)	Results (µg/m³)	8 hr TWA (μg/m³)
May 20,	, 2010	_							
FR-A-1	FB	Field Blank				0	3	< 3	N/A
FR-A-2	IWA	Room 113, south side, during daily office activities	2.0	0914	1524	740	4.1	< 4.1	N/A
FR-A-3	IWA	Room 103, Drill hall, SW corner on recruiting supplies table	2.0	0917	1525	736	4.1	< 4.1	N/A

PS = Personal sample, **IWA** = Inside work area, **N/A** = Not Applicable **Note**: The OSHA PEL of 50 μ g/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 Fort Ritchie Readiness Center, Bonus Environmental, LLC performed a visual inspection of the facility in regards to lead based paint. Bonus Environmental, LLC identified no areas of peeling paint which could potentially pose a lead exposure hazard.

3.2 – Presumed Asbestos Containing Materials

During the industrial hygiene evaluation of the Army National Guard Fort Ritchie Readiness Center, Bonus Environmental, LLC performed a visual inspection to identify presumed asbestos containing materials (PACM) and, if found, to note their condition. Bonus Environmental, LLC did not identify any PACM that was considered to be in poor or damaged condition.

3.3 - Water Damage/Mold Growth

During the industrial hygiene evaluation of the Army National Guard Fort Ritchie Readiness Center, Bonus Environmental, LLC performed a visual inspection to report the location and perform an evaluation of any water damaged or visible mold problems. Water-damaged building materials were noted on the ceiling tiles in room 109, the hallway outside of room 109, and in the hallway outside of women's restroom #122. In addition, fungal growth was noted on the drywall ceiling above the stalls in women's restroom #122. The source of the water damage was reported to Bonus Environmental, LLC as roof leaks.

3.4 - Housekeeping

During the industrial hygiene evaluation of the Army National Guard Fort Ritchie Readiness Center, Bonus Environmental, LLC performed an evaluation of the housekeeping practices. Bonus Environmental, LLC found the housekeeping to be in good order, with the exception of clutter (mostly vehicle parts) on the floor of the Drill hall.

P.O. Box 121 BESTAVALABLE 76894 *Mt. Pleasant, MI* 48804 FOIA Requested Record #915-0085 (MD) Released by National Guard Bureau Page 2997 of 5269

NGB / Fort Ritchie Army Nation	nal Guard Readiness Center
Project No. 1061-03	

3.5 – Employee Interviews

During the industrial hygiene evaluation of the Army National Guard Fort Ritchie 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 or indoor air quality concerns were identified.

3.6 – Indoor Air Quality

During the industrial hygiene evaluation of the Army National Guard Fort Ritchie Readiness Center, Bonus Environmental, LLC measured temperature, relative humidity, carbon monoxide (CO), and carbon dioxide (CO₂) throughout the facility. A calibrated TSI Q-Trak Model 7565 Indoor Air Quality Monitor equipped with a Q-Trak Probe 982 was utilized to record indoor air quality measurements.

Carbon dioxide is a natural component of air and the amount of 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 401 ppm to 510 ppm and indicate adequate ventilation within the facility.

Carbon monoxide, also known as the "silent killer," is a colorless, odorless, poisonous gas that results from the incomplete burning of common fuels such as natural or liquefied petroleum gas, oil, wood or coal. When carbon monoxide is inhaled, it enters the blood stream and reduces the ability of the blood to carry oxygen to vital organs, such as the heart and brain. Because it is impossible to see, taste or smell the toxic fumes, CO can harm you before you are aware it is in your work area. At lower levels of exposure, CO causes mild effects that are often mistaken for the flu. These symptoms include headaches, dizziness, disorientation, nausea and fatigue. The effects of CO exposure can vary greatly from person to person depending on age, overall health and the concentration and length of exposure. The OSHA has established a PEL of 50 ppm. OSHA standards prohibit worker exposure to more than 50 parts of the gas per million parts of air averaged during an 8-hour time period. The peak CO level for employees is 200 ppm. The CO measurements collected during this industrial hygiene evaluation ranged from 0.9 ppm to 1.3 ppm. CO levels were well below the OSHA PEL during this industrial hygiene evaluation.

During the industrial hygiene evaluation of the Army National Guard Fort Ritchie Readiness Center, Bonus Environmental, LLC collected temperature measurements. Temperature measurements

Bonus Environmental, LLC Worth 989 To NGB 960 IA Reading Room May, 2018 P.O. Box 121 BESTAVALABLE 76894 *Mt. Pleasant, MI* 48804 FOIA Requested Record #15-0085 (MD) Released by National Guard Bureau Page 2998 of 5269



NGB / Fort Ritchie Army National Guard Readiness Center	August 21, 2010
Project No. 1061-03	Page 6

throughout the facility ranged from 66.1°F to 68.2°F and are considered to be within an acceptable range.

During the industrial hygiene evaluation of the Army National Guard Fort Ritchie Readiness Center, Bonus Environmental, LLC collected relative humidity measurements. Relative humidity measurements throughout the facility ranged from 52.2% to 54.8% and are considered to be within an acceptable range. Indoor air quality measurements recorded during this industrial hygiene evaluation are summarized in the table below.

Army National Gua Indoor A	ord – Fort Ritcl ir Quality Mea	hie Readiness surements	Center	
Location	CO_2	CO (nnm)	Relative	<i>Temperature</i>
	(ppm)	(ppm)	11umially (76)	(
Outdoors, SW entrance	379	0.5	57.3	67.1
Room 113	462	0.9	52.5	68.2
Supply room	469	1.3	52.6	67.7
Lobby	481	0.9	53.5	67.4
Room 118, copy room	510	1.2	54.3	67.7
Room 138, fitness room	497	1.2	54.5	67.5
Room 137/136	470	1.0	54.2	67.2
Room 134, kitchen	417	1.0	52.9	67.3
Room 129	488	0.9	53.4	67.3
Room 103, Drill hall	401	0.9	52.2	66.8
Boiler room	464	0.9	54.8	66.1

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 Ligh	Fort Ritchie Read ting Survey	iness Center	
Location	Measurement in Foot Candles	Requirement in Foot Candles	Requirement Met?
Room 129 – Former indoor firing range/Msgt. Kunis's room	76.2	50	YES
Room 109 – Office	83.6	50	YES
Room 108 – Office	77.4	50	YES
Room 110 – Storage	38.4	30	YES
Supply room	19.4	30	NO
Room 105 – Storage	74.4	30	YES

Bonus Environmental, LLC Worfosted to NGB 901A Reading Room May, 2018 P.O. Box 121 BESTAN VAN LABLE 76894 *Mt. Pleasant, MI* 48804 FOIA Requested Record #15-0085 (MD) com Released by National Guard Bureau Page 2999 of 5269



NGB / Fort	Ritchie Army	National	Guard	Readiness	Center
Project No.	1061-03				

- Army National Guard Ligh	- Fort Ritchie Read ating Survey	liness Center	
Location	Measurement in Foot Candles	Requirement in Foot Candles	Requirement Met?
Supply storage	7.8	30	NO
Boiler room	19.1	30	NO
Room 113 – Break room	68.1	10	YES
Room 111 – Office	61.3	50	YES
Room 112 – Office	77.8	50	YES
Room 115 – Office	88.7	50	YES
Lobby	27.1	5	YES
Room 139 – Office	56.7	50	YES
Room 141 – Office	51.6	50	YES
Room 118 – Copy room	15.1	30	NO
Room 138 – Fitness room	44.1	30	YES
Room 122 – Women's restroom & showers	51.9	5	YES
Room 123 – Men's restroom	65.4	5	YES
Room 125 – Men's locker room	19.9	7	YES
Room 137/136 - Classroom/Dining room	66.8	30	YES
Hallway outside of room 136	14.1	5	YES
Room 134 – Kitchen	128.5	10	YES
Room 133 – Kitchen storage	38.3	30	YES
Room 132 – Mechanical room	56.7	30	YES
Room 131 - Restroom	62.3	5	YES
Room 103 – Drill hall	14.7	30	NO
Room 128 – Storage	11.4	30	NO
NW exterior room (caretaker's storage)	20.3	30	NO
Room 119 – Storage	28.8	30	NO
Room 130 – Storage	36.6	30	YES
Room 114 – Office	Lig	ght switch malfunctioning	5
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 Fort Ritchie Army National Guard Readiness Center located at 13817 Ritchie Road in Cascade, 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

Bonus Environmental, LLC Worth 989 To NGB 960 IA Reading Room May, 2018 P.O. Box 121 BESTAVALABLE 76894 *Mt. Pleasant, MI* 48804 FOIA Requested Record #9-15-0085 (MP) com Released by National Guard Bureau Page 3000 of 5269



NGB / Fort Ritchie Army National Guard Readiness CenterAugust 21, 2010Project No. 1061-03Page 8

hygiene evaluation of the facility was performed by Bonus Environmental, LLC representative Jeff Walworth on May 20, 2010.

Bonus Environmental, LLC recommends that any areas of concerns outlined within this report be evaluated to ensure the necessary actions are made. Following the completion of the industrial hygiene evaluation, Bonus Environmental, LLC found the following safety and/or indoor air quality conditions of the facility to be within acceptable levels/condition in regards to the following:

- Carbon Dioxide
- Carbon Monoxide
- Presumed Asbestos-Containing Materials
- Lead Wipe and Air Samples

- Ergonomics
- Temperature
- Relative Humidity

It has been a pleasure to be of assistance to you. Please contact us if you have any questions concerning this report or if we can be of any further assistance in any other environmental or occupational health matter.

Sincerely,



Principal Bonus Environmental, LLC



Principal Bonus Environmental, LLC

Fort Ritchie_10_Report.docx

Bonus Environmental, LLC Work 989 to NGB490IA Reading Room May, 2018 P.O. Box 121 BESTAVALABLE 70094 Mt. Pleasant, MI 48804 FOIA Requested Record #1715-0085 (MH) com Released by National Guard Bureau Page 3001 of 5269

<u>Appendix A</u>

Shop Diagram



FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 3003 of 5269

3



<u>Appendix B</u>

Lead Sample Results

Client: National Guard Bureau Address: 301-IH Old Bay Lane, Attn: 3 State Military Reservation Havre de Grace, Maryland 3 Attention:	NGB-AVN-SI, 21078 21078 alysis Type Sa	Job Name: Job Locatio Job Numbe P.O. Numbe P.O. Numbe Air Air Air	Fort Ri a: Cascad : Fort Ri r: W912h r: W912h r: W912h r: Volume (L) 740 740 736	itchie Armory de, MD tichie Armory K6-09-A-0003 tich Absorp nic Absorp nic Absorp (ft [*]) (ft [*]) N/A N/A	A Dtion A Lim	Analysis ug/m³ ug/m³	REC Chain Of Custod Date Submitted: Person Submitti Date Analyzed: Date Analyzed: Total ug	EIVED J Iy: 507 bg: 5/21 bg: 5/28	JN 1 4 2010 88 2010	Environmental Le See abritop.org for details 100470
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A Sample Client Sample Ana Number Number	Flame	Air Blank Air Air	0 740 736	N/A N/A	3 4.1	ug/m³ ug/m³		Final Rest	lt Co	meats
047776 FR-A-1	Ulanta.	Air Air	740 736	N/A	4.1	ug/m²		5		
047777 FR-A-2	riame	Air	736				4	2 1	ug ug/m³	
047778 FR-A-3	Flame			N/A	4	ug/m ³	, ∆	1.42	ug/m	
047779 FR-W-1	Flame W	Vipe Blank	****	N/A	12	an Bu	ŀ	<12	ue. Tue	
047780 FR-W-2	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
047781 FR-W-3	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
047782 FR-W-4	Flame	Wipe	***	0.111	110	ug/ft²	13	110	ug∕ft²	
047783 FR-W-5	Flame	Wipe	***	0.111	110	ug/ft²	<12	<110	ug/ft²	
047784 FR-W-6	Flame	Wipe	***	0.111	110	ug∕Ĥ²	<12	<110	ug/ft²	
047785 FR-W-7	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
04//86 FR-W-8]	Flame	Wipe	* *	0.111	110	ug/ft²	<12	<110	ug/ft²	
	riauc	wipe		0.111	110	ug/ft²	<12	<110	ug/ft²	
04//00 FK-W-10 I	Flame	Wipe	* *	0.111	110	ug/ft²	<12	<110	ug/\hat{H}^2	
	r laule	wipe		0.111	110	ug/ft²	<12	<110	ug/ft²	
04/190 FK-W-12 F	Flame	Wipe	****	0.111	110 1	ug/ft²	<12	<110	ug/ft²	
	Flame	Wipe		0.111	110 1	ug/ft²	<12	<110	ug/ft²	
04//92 FK-W-14 I	Flame	Wipe	***	0.111	110 1	ug/ft²	<12	<110	ug/ft²	
	Flame	Wipe	***	0.111	110 1	ug/ft²	<12	<110	ug/ft²	
04//94 F.R-W-16 F	Flame	Wipe	***	0.111	110 1	ug/ft²	<12	<110	ug/ft²	

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Released by National Guard Bureau Page 3006 of 5269

	100	010 NY E	109	010 Report Date: 6/1/2010	Page 2	Comments		ug/ft²	ug/fi ²	1g/ft²	1g/ft²	1g/ft²	f quality control samples int chip, wipe, and soil		Le Cato	11 0 11	GEdward Comment	O DUWARU CARDEY
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SIS	Chain Of Custody	Date Submitted:	Person Submitting	Date Analyzed:	is for Lead	Total ug		715	<12	<12	212	<12	summary for analyti ed with these sampe accreditation applie				Technic	
MALIN					ı Analys	porting Limit		-11/Sm	-11/gu	ug/tt²	-11/gn	ug/It ²	see uc associate NY ELAF	odili pico.	1		1	
2					rption	Re	110		110	110		011 110	M-3113B			X	g Cao	
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	-	Attn: NGB-AVN-SI, tion	land 21078	Non-Re		Analysis Type S	Flame	Flame	Flame	Flame	Flame	aints, and Soil/Solid	, Paints, and Soil/So per million (ppm) by	itcrograms ug/l condition unless othe	 Any additional dig g the result. 	any blank results	based on client ooratory.	
	National Guard Burea	301-IH Old Bay Lane. State Military Reserva	Havre de Grace, Mary			Client Sample Number	FR-W-17	FR-W-18	FR-W-19	FR-W-20	FR-W-21	Flame: Air, Wipes, P.	r Furnace: Air, Wipes 9 mg/Kg = parts	by weight ug = n Bre received in good o	e two significant digits lered when interpretin	are not corrected for	nd wipe samples are nor verified by this lal	
1	Client:	Address:		Attention:		AMA Sample Number	1047795	1047796	1047797	1047798	1047799	Inalysis Method for	Vnalysis Method Fol VA = Not Applicable Cbh - sorroot lood	or o - percent lead	lote: All results have hould not be consid	ir and Wipe results	inal results for air a upplied information	

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AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 19393

	Analysis Tyj Sample Type Analysis Dat	e: Flame 9: Wipe 5: \$/27/2010		
	Result	Percent Recovery	RPD	Conument
Preparation Blank Report Limit Verification Sample Expected Spike Level (ppm) 0.3333	-0061 рр 02937 рр	מז מיו 88.1%	• •	Acceptable Acceptable
Duplicate Sample 1 Duplicate Sample 2 Matrix Spike Analysis	mg 	′Kg Kg		Acceptable
Spiked Sample Spike Duplicate Laboratory Control Sample 1	· · ·	· · · · ·		Acceptable Acceptable
Laboratory Control Sample 2 Calibration Information	160-194 µg 256-311 µg	103.29% 105.42%	2 04%	Acceptable Acceptable

Correlation of Calibration Curve: 0 99969

All calibration verification samples are within acceptance limits.

Notes:

Chain Of Custody	AMA Sample Number	Client Sample Number		
507188	47779	and the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second sec		
\$07198		FR-W-I		
-14/4 00	47780	FR-W-2		

Page 1 of 2

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Chain Of Custody	AMA Sample Number	Client Sample Number
507188	47781	FR-W-3
507188	47782	FR-W-4
507188	47783	FR-W-S
507188	47784	FR-W-6
507188	47785	FR-W-7
507188	47786	FR-W-8
507188	47787	FR-W-9
507188	47788	FR-W-10
507188	47789	FR-W-11
507188	47790	FR-W-12
50718 8	47791	FR-W-13
507188	47792	FR-W-14
507188	47793	FR-W-15
507188	47794	FR-W-IA
507188	47795	FR-W-17
507188	47796	FR-W-18
507188	47797	FR-W-10
507188	47798	FR-W-20

Samples included in this Sample Delivery Group (SDG)

SDG Number: 19393

Page 2 of 2

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AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 19408

Percent

D.

RPD

Comment

Anatysis Type:	Flame
Sample Type:	Au
Analysis Date:	5/28/2010

			NECOTELY		
Preparation Blank	-0.075	ępm			å, mestable
Report Limit Verification Sample	0.2114	 ррт	84.6*>	· · ·	
Expected Spike Level (ppm) 0.25	- · ·				Acceptable
Duplicate Sample 1	- · · ·	me/Ke			
Duplicate Sample 2	· .	me/Ka		· .	
Matrix Spike Analysis	· -				Acceptable
Spiked Sample	·				
Spike Duplicate	· -				Acceptable
Laboratory Control Sample 1	-	-	· ·		Acceptable
	91.418	μB	106.60%6		Acceptable
coordinative control sample 2	99.378	μg	107.50%	0.84%	Acceptable

Result

Calibration Information

Correlation of Calibration Curve: 0/99992

All calibration verification samples are within acceptance limits.

Notes:

Samples includ	ed in this Sample Delivery Gro	oup (SDG)
Chain Of Custo	ody AMA Sample Number	Client Sample Number
507188	47776	FR-A-I
507188	47777	FR-A-2
SDG Number:	19408	

Page 1 of 2

Chain Of Custody	AMA Sample Number	Client Sample Number
507188	47778	ГR -А-3
507189	47845	F-A-I
507189	47846	F-A-2
507189	47847	F-A-3
507190	47867	CI +A+1
507190	47868	CL-A-2
507190	47869	CL-A-3
507201	48097	W-A-1
507201	48098	W-A-2
507201	48099	W-A-3
196472	49492	52410-JN01
196472	49493	52410-JN02
196472	49494	\$2510-JN01
196472	49495	52510-JN02
196472	49496	52610-3N01
196472	49497	52610-JN02
196472	49498	52710-JN01
196472	49499	52710-JN02

Samples included in this Sample Delivery Group (SDG)

SDG Number: 19408

Page 2 of 2

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AMA Analytical Services, Inc.

Focused on Results!!



Submitting Samples for National Guard Jobs

- 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 Non-Responsive
 - a. National Guard Subcontractor @<u>bonvJenvironmental</u>.com b.<mark>Non-Responsive</mark>tiv NGB: <u>Dus.army.mil</u> c. CIV NGB: <u>army.mil</u>
- 3) Hard Copy Reports & Invoices shall be managed in the following manner:
 - a. Original Invoices and Copies of Reports shall be sent to the National Guard National Guard Bureau Attn: Non-Responsive 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



- 4) All Pb Wipes shall be handled in the following manner:
 - a. All samples shall be analyzed utilizing FLAA procedures
 - b. Samples whose results are reported as less than the reporting limit, and the reporting limit is greater than 40ug/ft2 shall be re-analyzed utilizing GFAA procedures.
- 5) All other samples Pb Paints, Soils, & Airs, PCM Airs, PLM Bulks, TEM Airs, & TEM Bulks shall be analyzed utilizing standard analytical procedures

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 3014 of 5269

<u>Appendix C</u>

Photographs



NGB / Fort Ritchie Army National Guard Readiness Center Project No. 1061-03

August 21, 2010 Page 12



Building exterior, southwest entrance



Rm. 103, drill hall from north bay door



Rm. 122, water damaged/moldy ceiling above stairs



Hallway outside of Rm. 109, water stained ceiling tiles

Bonus Environmental, LLC Work 989 T NGB 961A Reading Room May, 2018 P.O. Box 121 BESTAN VALABLE COPY *Mt. Pleasant, MI* 48804 FOIA Requested Recold #9-15-0085 (MP) com Released by National Guard Bureau Page 3016 of 5269



Rooftop AHU, south side of roof, fan side



Rooftop AHU, south side of roof, filter side



NGB / Fort Ritchie Army National Guard Readiness Center Project No. 1061-03

August 21, 2010 Page 13



Boiler Room



Exterior POL storage

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<u>Appendix D</u>

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DEPARTMENT OF THE ARMY US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

6 SEPTEMBER 2005

MEMORANDUM FOR Region North Industrial Hygiene Office (NGB-AVS-SI-IH/ Ms. Non-Responsive) Army National Guard Bureau, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, MG William C. Purnell Armory, Gunpowder Military Reservation, Glen Arm, MD, Project No. 55-ML-01ED-03/05

1. Enclosed is the final copy of the subject report and two CD-ROMs.

2. The project number for this service reflects the current fiscal year of dispatch and the actual field work which was completed for fiscal year 2003. The State of Maryland Army National Guard occupational health nurse was immediately notified in writing of findings necessitating immediate corrective action in Maryland armories. In addition, the National Guard Bureau Region North Industrial Hygiene Office has been notified of all the results of lead in dust sampling conducted in all facilities. Draft reports were reviewed by you or other members of the National Guard and members of this Center, including our editorial staff, during drafting stages in report preparation leading up to the final report.

3. Our point of contact is Ms. Non-Responsive, at commercial (410) 436-5475/3118, DSN 584-5475/3118, or electronic mail: Non-Responsive @us.army.mil

FOR THE COMMANDER:

Non-Responsive

Director, Occupational Health Sciences

Encl

Readiness thru Health



FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 3021 of 5269

U.S. Army Center for Health Promotion and Preventive Medicine

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MDARNG FACILITIES IH BASELINE SURVEY MG WILLIAM C PURNELL ARMORY GLEN ARM, MD PROJECT NO. 55-ML-01ED-03/05 31 JULY 2003

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Readiness Thru Health

Posted to NGB FOIA Reading Room May, 2018

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DEPARTMENT OF THE ARMY US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

EXECUTIVE SUMMARY MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS MG WILLIAM C. PURNELL ARMORY GLEN ARM, MD PROJECT NO. 55-ML-01ED-03/05 31 JULY 2003

1. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard (MDARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions. This survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee for the Defense Occupational and Environmental Health Readiness System.

2. CONCLUSIONS.

a. <u>Lead Exposure</u>. Levels of lead in dust that exceeded safe limits for adults and children were identified. These levels may result in health hazards to adults and to children visiting the Armory. Personnel working in the Armory were tracking dust containing lead throughout the facility. Cleaning areas with elevated levels of lead in dust may further prevent lead from becoming redistributed throughout the Armory.

b. <u>Asbestos</u>. There was a potential for exposure to asbestos in the Armory. Damaged asbestos insulation, if present, may become friable and asbestos fibers released, resulting in exposure to Armory occupants. The pipe insulation may be asbestos-containing material (ACM). This should be confirmed by reviewing Armory records or by sampling. Army policy requires the Armory to establish and execute an Asbestos Management Plan (AMP) for any asbestos in the facility, and to take immediate corrective action where a possible asbestos hazard has been identified.

c. <u>Heating, Ventilation, and Air Conditioning Systems</u>. The heating and cooling systems were not operating in some rooms in the building.

d. <u>Other Building Concerns</u>. The point of contact stated that the drinking water had a bad taste.

Readiness thru Health



EXSUM, MDARNG, III Baseline Surveys, Glen Arm, MD, Project No. 55-ML-01ED-03/05

3. RECOMMENDATIONS.

a. <u>Lead Exposure</u>. Health Hazard Risk Assessment Code (RAC) 3. 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 (USACHPM) decontamination levels. Address all potential lead hazards before continuing to extend the use of this facility to children. If children will visit this facility, clean the floors in the Drill Hall and Classroom to the Environmental Protection Agency lead in dust standards for young children, and clean other horizontal surfaces in the Drill Hall and Classroom to the NGB Region North and USACHPPM decontamination level for lead in dust on frequently contacted surfaces. Ensure that personnel wear disposable gloves and disposable coveralls as extra protection when working in all areas identified as having elevated levels of lead. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup.

b. Asbestos Exposure, Health Hazard RAC 3 if asbestos is present.

(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 Glen Arm Armory.

(2) Perform an asbestos survey if no records are located.

(3) If asbestos is found, develop and implement an AMP if there is not one for the Armory,

(4) If the insulation is determined to be ACM and becomes damaged, encapsulate or remove it as soon as possible.

c. Heating, Ventilation, and Air Conditioning Systems. RAC 3. Investigate operating problems with the heating and cooling systems. Consider re-surveying indoor air conditions in hot weather with windows closed and systems fully operational.

d. <u>Other Building Concerns</u>. RAC 3. Hire an accredited laboratory certified in lead in water analyses to test the drinking water from water fountains and faucets for lead and other contaminants.

MDARNG IH Baseline Surveys, Glen Arm, MD, Project No. 55-ML-01ED-03/05

TABLE OF CONTENTS

Paragraph

I.	REFERENCES	.1
2.	PURPOSE OF EVALUATION	.1
3.	AUTHORITY	1.
4.	BACKGROUND INFORMATION	I,
5.	FACILITY EVALUATION	.2
6.	ASSESSMENT CRITERIA FOR LEAD	.2
7.	SAMPLING RESULTS, DISCUSSION, AND CONCLUSIONS	3
8.	RECOMMENDATIONS	.4
9.	PHOTOGRAPHS	.5
10.	ADDITIONAL ASSISTANCE	.6

Appendices

Α.	REFERENCES	A-1
Β.	SAMPLING SHEETS AND LAB ANALYSES	B -1
С.	ASSESSMENT CRITERIA FOR LEAD	C-1
D.	LEAD CLEANING GUIDANCE	D-1
E.	PHOTOGRAPHS	E-I

TABLE

bead in ourrace Proof on per Elocations and Analytical Results and manimum methods.	Lead in	Surface Dust	Wipe Locations and	Analytical	Results
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DEPARTMENT OF THE ARMY US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS MG WILLIAM C. PURNELL ARMORY GLEN ARM, MD PROJECT NO. 55-ML-01ED-03/05 31 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. Non-Responsive, 28 February 2003, subject: SAB.

4. BACKGROUND INFORMATION.

a. <u>Armory Mission and Background Information</u>. The Armory mission was Special Forces. The resident units were B-2 BN-20 Special Forces Group ABN and the C-1 BN-20 Special Forces Group ABN.

b. Date of Construction. The construction date was 1974.

c. <u>Armory Use by Children</u>. The point of contact (POC) stated that children occupied the drill area or classroom occasionally for family support meetings. The Maryland Military Department is currently advertising Glen Arm Armory as available for rental for activities that include young children.

d. <u>POC</u>. The POC was Mr. Armory Manager, 10901 Notchcliff Road, Glen Arm, MD 21057-9998, Phone. 410-592-2535.

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MDARNG III Baseline Surveys, Glen Arm, MD, Project No. 55-ML-01ED-03/05

5. FACILITY EVALUATION.

a. <u>Sampling</u>. Surface lead in dust, air and paint sampling was conducted to determine the existence of lead hazards. Results are shown in Appendix B.

b. Physical Condition of Facilities.

(1) Paint. The date of construction of the facility indicated that the use of lead in paint was likely.

(2) Asbestos. The POC stated that some pipe insulation may have been asbestoscontaining material (ACM). No Asbestos Management Plan (AMP) was found.

(3) Mold and Moisture Problems. No mold or moisture problems were observed or reported.

(4) Building Physical Condition. The building was in good condition and had been well maintained. There was fresh paint throughout the facility.

(5) Indoor Firing Range (IFR). The IFR had been closed, lead had been abated, and the IFR had been converted to a locker room. This room was called the Team Room.

c. Safety and Occupational Health Programs. No Lead Hazard Management Plan or other occupational health program records were found.

d. <u>Heating</u>, <u>Ventilation</u>, and <u>Air Conditioning Systems</u>. The building was heated with central heat and air conditioning. The beating and cooling systems were not working effectively in the wing containing the supply rooms, the Team Room, and the Weight Room. Mr. Frick reported having submitted work orders but the ventilation problems had never been resolved.

e. <u>Noise Dosimetry</u>. No operations with the potential to generate hazardous noise levels were identified.

f. Lighting. All areas were visually judged to be adequately lit.

g. Other Building Concerns. The POC stated that the drinking water had a bad taste.

6. ASSESSMENT CRITERIA FOR LEAD. See Appendix C.

a. Lea<u>d in Air</u>. The Army complies with the Occupational Safety and Health Administration (OSHA) 8-hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter ($\mu g/m^2$) of air.

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MDARNG III Baseline Surveys, Glen Arm, MD, Project No. 55-ML-01ED-03/05

b. Lead in <u>Dust</u>. 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 National Guard Bureau (NGB) Region North concurs with the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended safe limit of 200 $\mu g/ft^2$ on floors and frequently contacted surfaces, which is more stringent for window sills than the EPA/State standards.

c. Lead in Paint. Paint containing lead levels of 0.5 percent or more by weight in dried solid (also reported as 5000 milligrams per kilogram) is considered to be Lead Based Paint (LBP) according to both Federal and Maryland State Regulations. Paint containing lead levels of more than 0.7 milligrams per square centimeter is considered to be LBP according to Maryland State Regulations. In Army Regulation 420-70, Buildings and Structures, lead-contaminated paint (LCP) is defined as any paint containing detectable amounts of lead. The Army considers LCP to be potentially hazardous to children if it is disturbed or deteriorating.

d. <u>Lead Careinogenicity</u>. The Department of Health and Human Services National Toxicology Program (NTP) released the Report on Careinogens, Eleventh Edition in February 2005. The NTP report lists "lead and lead compounds" as "reasonably anticipated to be human careinogens."

7. SAMPLING RESULTS, DISCUSSION, AND CONCLUSIONS.

a. <u>Lead in Dust</u>. Lead in dust sample locations and analytical results are shown in the Table. Sample results greater than 40 μ g/ft² for floors or 200 μ g/ft² for other surfaces are highlighted.

Wipe Sample Number	Location of Samples	Result (µg/ft²)
GAW0I	LOCKER ROOM (CONVERTED IFR) FLOOR OF FORMER BULLET TRAP	25
GAW02	DESK TOP IN CONVERTED IFR	56
GAW03	FOOD PREPARATION AREA IN KITCHEN	<23
GAW04	WORK OUT ROOM ON WALL NEAR EXTERIOR EXIT	<23
GAW05	WINDOW SILL IN ROOM 125 A	568
GAW06	LOCKER ROOM OFF MEN'S ROOM. ROOM 124 ON FLOOR	<23
GAW07	ROOM 108 (STORAGE) SUPPLY ROOM FLOOR	97

TABLE. Lead in Surface Dust Locations and Analytical Results.

3

MDARNG IH Baseline Surveys, Glen Arm, MD, Project No. 55-ML-01ED-03/05

Three lead in dust results exceeded the EPA and State of Maryland limits for young children. One lead in dust result exceeded the NGB Region North and USACHPPM recommended decontamination levels for lead in dust on frequently contacted surfaces. There were very high levels of lead dust on the window sill in Room 125A. Personnel working in this room were potentially exposed to lead, and were tracking lead out of the area and redistributing it into adjacent rooms in the Armory. This can result in lead exposures for the general workforce and for children visiting this facility. Three lead in dust sample results exceeded the EPA and the State of Maryland lead exposure standard for children of 40 μ g/ft² on floors and 250 μ g/ft² on window sills. These levels are hazardous to children exposed to lead dust through physical contact, inhalation, or ingestion of lead dust while visiting the Armory.

b. <u>Lead in Air</u>. General area lead in air sampling was conducted in Room 104C, which was occupied by up to 14 people, and in Room 127A, which had the potential for three occupants. The air sample results were less than 4 μ g/m³, and were below the laboratory analytical reporting limit for lead in air of 1 μ g/sample, as well as the OSHA standard of 50 μ g/m³ for lead in air over an 8 hour day.

c. <u>Lead in Paint</u>. Lead in deteriorated paint sampling was conducted on the supply (storage) room ceiling in Room 110. This sample result was also representative of the type of paint in Rooms 107, 108, and 110. The paint was LCP and may be hazardous to children.

d. Asbe<u>stos</u>. There was a potential for exposure to asbestos in the Armory. Damaged asbestos insulation, if present, may become friable and asbestos fibers released, resulting in exposure to Armory occupants. The pipe insulation may be ACM. This should be confirmed by Armory records or by sampling. Army policy requires the Armory to establish and execute an AMP for any asbestos in the facility, and to take immediate corrective action where a possible asbestos hazard has been identified.

8. RECOMMENDATIONS. The Department of Defense Instruction 6055.1 provides Risk Assessment Codes (RACs) for health hazards, a procedure which allows assessment of the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and combines the hazard severity and accident probability into a single number. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

a. <u>Lead Exposure</u>. Health Hazard RAC 3. Clean horizontal surfaces in the administrative areas to the NGB Region North and USACIIPM decontamination levels. Address all potential lead hazards before continuing to extend the use of this facility to children. If children will visit this facility, clean the floors in the Drill Hall and Classroom to the EPA lead in dust standards for young children, and clean other horizontal surfaces in the Drill Hall and Classroom to the NGB

MDARNG 1H Baseline Surveys, Glen Arm, MD, Project No. 55-ML-01ED-03/05

Region North and USACHPPM decontamination level for lead in dust on frequently contacted surfaces. Ensure that personnel wear disposable gloves and disposable coveralls as extra protection when working in all areas identified as having elevated levels of lead. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after clean up.

b. Asbestos Exposure. Health Hazard RAC 3 if asbestos is present.

(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 Glen Arm Armory.

(2) Perform an asbestos survey if no records are located.

(3) If asbestos is found, develop and implement an AMP if there is not one for the Armory.

(4) If the insulation is determined to be ACM and becomes damaged, encapsulate or remove it as soon as possible.

c. <u>Heating, Ventilation, and Air Conditioning Systems</u>. RAC 3. Investigate operating problems with air handling unit systems. Consider re-surveying indoor air conditions in hot weather with windows closed and systems fully operational.

d. <u>Other Building Concerns</u>. RAC 3. Hire an accredited laboratory certified in lead in water analyses to test the drinking water from water fountains and faucets for lead and other contaminants.

9. PHOTOGRAPHS. See Appendix E.

MDARNG IH Baseline Surveys, Glen Arm, MD, Project No. 55-ML-01ED-03/05

10. ADDITIONAL ASSISTANCE. For additional assistance or questions concerning this report, please contact the undersigned at DSN 584-3118, commercial 410-436-3118, or by electronic mail Non-Responsive @us.army.mil



Industrial Hygienist USACHPPM Lead and Asbestos Team Leader Industrial Hygiene Field Services Program

APPROVED:



Technical Program Manager Industrial Hygiene Field Services Program

6

MDARNG Facilities IH Baseline Surveys MG William C Purnell Armory, Glen Arm, MD Project No. 55-ML-01ED-03/05

APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

APPENDIX A

REFERENCES

1. Title 29, Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration, current edition. http://www.osha.gov/comp-links.html

2. Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program, August 19, 1998. http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf

3. AR 40-5, Medical Service, Preventive Medicine, 15 October 1990. http://www.usapa.army.mil/pdffiles/r40_5.pdf

4. AR 385-10, The Army Safety Program, 29 February 2000. http://www.usapa.army.mil/pdffiles/r385_10.pdf

5. DA PAM 40-503, Medical Services, Industrial Hygiene Program, 30 October 2000. http://www.usapa.army.mil/pdffiles/p40_503.pdf

6. USACHPPM Interim Report No. 39-EJ-1157-99, Derivation of Wipe Surface Screening Levels for Environmental Chemicals, 1999.

7. OSHA Instruction, CPL 02-02-058 - CPL 2-2.58 - 29 CFR 1926.62, Lead Exposure In Construction; Interim Final Rule-- Inspection and Compliance, Procedures, 1993. http://www.osha.gov/pls/oshaweb/owadisp.show/document?p/table=DIRECTIVES&p/id=1570/

 U.S. Department of Housing and Urban Development (HUD), Technical Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing 1998. http://www.hud.gov/offices/lead/guidelines/hudguidelines/index.cfm

A-2

MDARNG Facilities IH Baseline Surveys MG William C Purnell Armory, Glen Arm, MD Project No. 55-ML-01ED-03/05

APPENDIX B

SAMPLING SHEETS AND LAB ANALYSES

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Glen Arm - Lead Dust Wipe Samples

						_	1	
				Indoor R.	ange Ind	'n		
Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (ug/ft ²)
			No			Yes		
GAW01	Glen Ann	Glen Arm					Locker room (Converted FR) floor where forwer bullet trap	25
GAW02	Glea Arm	Glen Arm					Desk top in converted IFR	56
GAW03	Glen Anni	G'en Ann					Food preplates in Sighen	BDI.
GAW04	Glen Arm	Glen Arm					Work our more op wall near externer exit	BDI.
GAW05	Gten Arm	Gien Ano					Window sill in mom 125 A	568
GAW06	Glen Aca	Glen Ann					Locker room off men's room . Room 124 on	ртк
GAW97	G en Arm	Glet Ann					Room 108 (storage) supply mem floor	ųγ

13-2

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: Subcontract Number: Laboratory Report: Project Description: RES NA RES 96187-1 None Given None Given

USACHPPM

USACHPM, ATTN: MCHB-TS-OFS Bldg 1570 APG MD 21010

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association, Lab ID 101533 - Accreditation Certificate #480. The laboratory is currently proficient in both PAT & ELPAT programs respectively.

Reservoirs has analyzed the following sample(s) using Atomic Emission Spectroscopy - Inductively Coupled Plasma (AES-ICP) per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the analysis table. Results have been sent to your office.

RES 96187-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you should have any questions about this report, please feel free to call me at 303-964-1986.

Sincerely,

Non-Responsive President

Page 1 of 3

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RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896 AIHA Certificate of Accreditation #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
Chent Project Description:	None Given
Date Samples Received:	August 4, 2003
Analysis Type:	USEPA SW846 3050B / AA(7420)
Turnaround:	3-5 Day
Date Samples Apalyzed:	August 11, 2003

Client	Lab		Sample	LEAD	Detection	LEAD
1D Number	ID N	umber	Area	(µg)	Limit	CONCENTRATION
			(sq.ft.)		(ug/sq.ft.)	(µg/sq.ft_)
CF BLANK01	FМ	802204	0.11	BDL	23	BDL
CF W01	FM	802205	0.11	BDL	23	BDI.
CF W02	EM	802206	0.11	BDL	23	HDL.
CF W03	EM	802207	0.11	BDL	23	BDL
CF W04	EM	802208	0.11	BDI.	2.3	BDf.
CF W05	EM	802209	0.11	8.0	23	73
CF BLANK02	EM	802210	0.11	BDE	23	BDU
CF W06	EM	802211	0.11	46.3	23	421
CF W07	EM	802212	0.11	BDI.	23	BDL
WR BLANK01	FM	802213	0.11	BDL	23	BDL
WR W01	EM	802214	0.11	BDL	23	BDI.
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	2.3	132
WR W05	EM	802218	0.11	BDL	23	BDL
WR BLANK02	EM	802219	0.11	BDI.	2.3	BDL
WR W05	FM	802220	0.11	BDI.	23	BDI.
WR W07	EM	802221	0.11		No Sample Subm	itted In Fole
EC BLANK01	EM	802222	0.11	BDL	23	BDL
EC W01	EM	802223	0.11	BDL	23	BDL
EC W02	EM	802224	0.11	BDE	23	BDL.
EC W03	EM	802225	0.11	2.5	23	23
EC W04	ЕM	802226	0.11	BDI.	23	BDL
EC W05	EM	802227	0.11	BDL	23	BDL,
EC BLANK02	EM	802228	0.11	BDL	2.3	BDL
EC W06	EM	802229	0.11	BDI.	23	BDL
EC W07	EM	802230	0.11	BDI.	2.3	BDL
EC W08	FM	802231	0.11	BDI.	2.3	BDL
GA BLANKOI	EM	802232	0.11	HDE.	23	BDL.
GA W01	EM	802233	0.11	2.7	23	25

BDL + Below Detection Limit

Page 2 of 3

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RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896 AIBA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS; LEAD BY WIPE SAMPLING

RES Job Number:	RES 96187-1
Chent.	USACHPPM
Client Project Number / P.O.:	None Given
Chem Project Description:	None Given
Date Samples Received:	August 4, 2003
Analysis Type:	USEPA SW846 3050B / AA(7420)
Turnaround:	3-5 Day
Date Samples Analyzed:	August 11, 2003

Client	Lab	Sample	LEAD	Detection	LEAD
ID Number	ID Number	Area	(ug)	Limit	CONCENTRATION
		(sq.ft.)		(ug/sq.ft.)	(jug/sq.ft.)
GA W02	EM 802234	0.11	6.2	23	56
GA W03	EM 802235	0.11	BDL	23	BD1.
GA W04	EM 802236	0.11	BDL	23	BDL
GA W05	EM 802237	0.11	62.5	23	568
GA BLANK02	EM 802238	0,11	BDI.	23	BDI.
GA W06	EM 802239	0.11	BDL	23	BDL
GA W07	EM 802240	0.11	10.7	23	97

*Calculations Based On A 1 sq.ft. Sample Area Unless Otherwise Noted

BDI Below Detection Limit

Data Ca 🔗

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RESERVOIRS ENVIRONMENTAL, INC.

NVI.AP Accredited Laboratory #101896 AIHA Certificate of Accreditation #480 LAB 1D 101533

TABLE ANALYSIS:

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S: LEAD IN PAINT

RES Job Number:	RES 96188-1
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, 2000

Client	Lab	Detection	LEAD	
1D Number	1D Number	Limit	CONCENTRATION	
		(%)	(%)	
CF BULK 01	EM 802169	0.005	BDL	
CF BULK 02	EM 802170	0.005	0.053	
CF BULK 0J	EM 802171	0.006	0.072	
CF BULK 04	. EM 802172	0.005	0.093	
CF BULK 05	EM 802173	0.005	0.134	
EC BULK 01	EM 802174	0.009	0.270	
EC BULK 02	EM 802175	0.005	0.052	
EC BULK 03	EM 802176	0.005	0.047	
EC BULK 04	EM 802177	0.005	BDL	
EC BULK 05	EM 802178	0.005	0.005	
GA BOLK OI	EM 802179	0.005	0.012	

BDL ·· Below Detection Limit

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Page 2 of 2

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TEST REPORT Page 1 of 2 8/11/03



Submitted To: Non-Responsive Commander, USACHPPM MCHB TS OFS; 5158 Blackhawk Road APG, MD 21010-5403

Reference Data:	Lead
Client Sample No.:	GAAS01 through GABLANK02
P.O. No.:	Not Available
Sample Location:	Glen Arm NG Armory
Sample Type:	Filter
Method Reference:	NIOSH 7300
DCL Set ID No.:	03-5-3737
DCL Sample ID No.:	03-22938 through 03-22941
Sample Receipt Date:	8/4/2003
Preparation Date:	08/06/03
Analysis Date:	08/07/03

The samples were prepared and analyzed in accordance with NIOSH method 7300 using a Perkin Elmer 3000XL ICP.

The sample condition upon receipt was acceptable except where noted.

The results are in the enclosed data table. Results relate only to the items tested and are not blank corrected unless indicated in the data table.

This report shall not be reproduced except in full, without the written approval of the laboratory.

Non-Responsive	
) Nalvet	

Analyst



WEST COAST OFFICE 11 SANTA YORMA COURT NOVATO, CALIFORNIA 94945 800 280-8071, FAX 415 893-9469

CINCINNATI OFFICE 4388 GLENDALE-MILFORD ROAD CINCINNATI, OHIO 45242-3706 513 733-5336, FAX 513 733-5347

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TEST REPORT Page 2 of 2 03-8-3737

Results Lead

Client #	DCL #	Sample	µg/sample	mg/m ³
		Volume (L)		
GAAS01	03-22938	242.8	ND	<0.004
GAAS02	03-22939	271.4	ND	<0.004
GABLANK01	03-22940	0	ND	-
GABLANK02	03-22941	0	ND	-
	Prep Blank		ND	
% Recovery	LCS		99.	
RPL			1.	

ND = not detected at or above the reporting limit (RPL). LCS = laboratory control sample.



Analyst



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MDARNG Facilities IH Baseline Surveys MG William C Purnell Armory, Glen Arm, MD Project No. 55-ML-01ED-03/05

APPENDIX C

ASSESSMENT CRITERIA FOR LEAD

SUBJECT: National Guard Bureau Region North Industrial Hygiene Office Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than $200 \ \mu g/ft^2$. 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(c) (8) (viii)) and State of Maryland standards are not directly applicable because they are developed for floors (40 μ g/ft²), windowsills (250 μ g/ft²)and window troughs (400 μ g/ft²) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. OSHA has no specific requirement for work area surfaces. The OSHA lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and bygienic practices.

c. OSHA cites a level of 200 μ g/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 μ g/fl² is a safe surface contamination level for adult exposures. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

c. 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 μ g/m³ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

D-2

MDARNG Facilities IH Baseline Surveys MG William C Purnell Armory, Glen Arm, MD Project No. 55-ML-01ED-03/05

APPENDIX D

LEAD CLEANING GUIDANCE
CHAPTER 14:

Ste	·ρ-t	by-Step Summary
Ι.	In	troduction
	А.	Performance Standard
	Β.	Small Dust Particles
	С.	Difficulties in Cleaning
		1. Low Clearance Standards
		2. Worker Inexperience
		3. High Dust-Producing Methods and/or Inadequate Containment
		4. Deadlines 14-6
11,	Co	ordination of Cleaning Activities
	Α.	Checklist
	В.	Equipment Needed for Cleaning
	¢.	Waste Disposal
III.	ĊIe	eaning Methods and Procedures
	Α.	Containment
	в.	Basic Cleaning Methods: Wet Wash and Vacuum
		Cleaning Techniques
		1. HEPA Vacuuming
		2. Wet-Detergent Wash
		3. The HEPA/Wet Wash/HEPA Cycle
		4. Scaling Floors
IV.	Or	der of Cleaning Procedures During Lead Hazard Control 14-16
	Α.	Precleaning Procedures
	₿.	Ongoing Cleaning During the Job
	C.	Daily Cleaning Procedures
		1. Large Debris
		2. Small Debris
		3. Exterior Cleaning
		4. Worker Protection Measures
		5. Maintaining Containment

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V.	Or	der of Final Cleaning Procedures After	
	Lea	ad Hazard Control 1	4-19
	Α.	Final Cleaning 1	4–19
		1. Decontamination of Workers, Supplies, and Equipment	4-19
	В.	Preliminary Visual Examination 1	4-20
	\mathbf{C}_{\cdot}	Surface Painting or Sealing of Nonfloor Surfaces 1	4-20
	D.	Final Inspection 1	4-20
	Ε.	Recleaning After Clearance Failure	4-20
VI.	Cle	eaning Cost Considerations 1	4-21
	А.	Initial Clearance Test Failure Rates 1	4-21
	Β.	Key Factors In Effective Cleaning 1	4-21
	С.	Special Problems	4-21
VI	I. A	Iternative Methods	4-22
	А.	Vacuums 1	4-22
	Β.	Trisodium Phosphate and Other Detergents	4-22

- Step-by-Step Summary

- 1. Include step-by-step procedures for procleaning, 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.
- 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.
- For final cleaning, wait at feast 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 distodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
- 10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
- 11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
- 12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
- 13. Paint or otherwise seal treated surfaces and interior floors.
- 14. Conduct a clearance examination (see Chapter 15).
- 15. If clearance is not achieved, repeat the final cleaning.

Step-by-Step Summary (continued) -

- 16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.
- 17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.
- 18. Cleaning equipment list:
 - HEPA vacuums.
 - Detergent.
 - Waterproof gloves.
 - Rags.
 - Sponges.
 - Mops.
 - Buckets.
 - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
 - 6-mil plastic bags.
 - Debris containers.
 - Waste water containers.
 - Shovels.
 - Rakes.
 - Water-misting sprayers.
 - 6-mil polyethylene sheeting (or equivalent).

Chapter 14:

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 recormended. 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 untess 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 additronal 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 integrat and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove all leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 µg/ft² on floors.
- 500 µg/ft² on interior window sills (stools).
- 800 µg/ft² on window troughs (the area where the sash sits when closed).
- 800 µg/ft² on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a fead paint harard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent defays, final testing and final cleaning activities should be coordinated.

2. Worker Inexperience

To understand the level of cleanfiness 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 amportant 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 precteaning, 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).

Regulations governing hazardous and nonhazardous waste storage, transportation, and disporal 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 dotailed 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 anside of work areas. Inadequately constructed or maintained containment or poor work practices will rusult 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 feaded 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 unlakely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that finedust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below

FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 3051 of 5269

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 section 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 profilters 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 ceifings, watls, 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.



Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a highphosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces. and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detorgents 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 fimited trials by several



Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing. Pressure gauge

14 - 9



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 delergents.

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 band sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wetwash process.

Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other fead-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 galtons should be used to clean no

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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.

—- Chapter 14: Cleaning —



- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle rumoves any remaining particles dislodged but not removed by the wet wash.

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 nozzlo for bare floors and the carpet beater for rugs.

Move slowly

Vacuum slowly so the HEPA vacuum can pick up all the lead dust.



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, fimitations 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.



Rubber Cone

Dust Brush



Powered Carpet Beater



Wheeled Floor Nozzle

14-13

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- Chapter 14: Cleaning -

Figure 14.4c (continued)

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Wash all surfaces with suitable detergents

Wash all surfaces in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces



Wet Mop Floor



Don't Dry Sweep

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MDARNG Facilities III Baseline Surveys MG William C Purnell Armory, Glen Arm, MD Project No. 55-ML-01ED-03/05

APPENDIX E

PHOTOGRAPHS

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 3062 of 5269



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Industrial Hygiene Study

National Guard Facility Glen Arm Readiness Center 10901 Notchcliff Road Glen Arm, MD 21057

Prepared for:

National Guard Bureau Region North IH Office 301-IH Old Bay Lane Havre de Grace, Maryland 21078

Prepared by:

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Report Date: December 30, 2008

Project ID: IHMO080101.03



Senior Industrial Hygienist



Manager, Charlotte Operations

TABLE OF CONTENTS

Executive Summary	3
Operation Description	4
Noise	4
Lead Testing	4
Lighting	5
Indoor Air Quality	6
Suspect ACBM	8
Maintenance Bay	8
Ventilation Assessment	8
Limitations	8
References	9

List of Appendices

Appendix A:	Photographs
Appendix B:	Laboratory Analysis Report



EXECUTIVE SUMMARY

An industrial hygiene survey was conducted August 5, 2008 at the Readiness Center located in Glen Arm, 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, and three (3) of the six (6) surface samples collected were found to have detectable levels of lead.

Indoor air quality parameters were also evaluated during the assessment. Indoor air quality was found to be within those parameters established by the Environmental Protection Agency (EPA) and American Society of Heating, Refrigerating, and Air-conditioning Engineers, Inc. (ASHRAE). The firing range is inactive, having been converted into a locker room, but could have contributed to lead exposure to building occupants. If not addressed, these may provide sources of poor indoor air quality.

During the assessment, written programs for Health and Safety, NESHAP Operations and Maintenance Asbestos Survey, and the Hazard Communication Program were requested for review, however, the onsite personnel was not able to locate the documents.



Operation Description

The Glen Arm Readiness Center primarily serves as an equipment storage facility and administrative work. The facility consists of a single story response center that contains office spaces, classrooms, a kitchen area, an assembly hall, mechanical room, locker rooms, and unit storage areas.

The exterior walls of the building were constructed of a concrete block system (CBS) finished with red brick. The interior walls were composed of concrete block and in some areas were finished with drywall. The roof of the facility consisted of two systems; one a flat rubber membrane roof system covered with stone, and the other a pitched metal roof system. The heating, ventilating, and air conditioning system (HVAC) consisted of a split direct-expansion (DX) system. The floors were composed of a poured concrete slab and in some areas were finished with vinyl floor tiles. The ceilings were generally composed of metal corrugated roof deck and in some areas were finished with a suspended drop ceiling system.

Site personnel at the time of the site assessment consisted of five (5) administrative maintenance personnel. The employees on site were conducting general administrative work.

Noise Survey

Employees were not performing tasks that provided excessive noise levels, as such; noise exposure monitoring was not conducted.

Lead Testing

At the time of the assessment, no activities were observed which may lead to lead exposure other than ammunition handling. The facility contains an indoor firing range that was converted to a locker area.

Various surfaces within the facility were screened for lead using surface/wipe samples and the collection of air samples. Surface/wipe samples were collected using Ghost WipeTM samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 µm MCE cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, MD for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix B.



Lead Testir	ng Results Su	Immary		
Location	Air ug/m ³	Surface ug/ft ²	Bulk	Chip %Pb
Range	ND			
Left Hallway	ND			
Blank	ND			
Room 105 Return		170		
Left Hallway Floor		ND		
Range-Top of Locker		ND		
Kitchen- Top of Refrigerator		170		
Room 116-Top of Desk		ND		
Room 105-Supply Duct		1600		
Blank		ND		
Criteria	50	200	5,000	0.5

Key: ND – None Detected PB – Lead

Detectable levels of lead were identified in the kitchen and office 105. The National Guard Bureau currently utilizes 200 ug/ft² as a benchmark for identifying contaminated surfaces. In the" Derivation of Wipe Surface Screening Levels for Environmental Chemicals", the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft² is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, HUD levels of 40 μ g/ft² on floors and 250 μ g/ft² on windowsills should be observed.

No detectable levels of lead were identified in those air samples collected. Currently, OSHA observed an 8-hour time weighted average of 50 ug/m³.

<u>Lighting</u>

A lighting assessment was conducted throughout the facility. The survey was conducted with large bay doors closed. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. 98047EL). The light meter was last calibrated on February 22, 2008. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.



Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Room 105	44-63	30-50	Yes
Foyer	42-102	10	Yes
Room 127	48-56	30-50	Yes
Right Hallway	38-62	5	Yes
Room 117	78-142	30-50	Yes
Room 117 @ Desk	96-102	30-50	Yes
Left Hallway	7-57	5	Yes
Locker Room 112-Old Range	11-31	7	Yes
Room 120-Gym	19-38	30	Yes
Room 121-Latrine	5-17	5	Yes

Light Survey Assessment Summary

Lighting within the facility was found to be sufficient.

Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTrak IAQ Meter, Model 8550 (Serial No. 11050). The IAQ Meter was last calibrated in January 2008.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2004). 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 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 77.9 $^{\circ}$ F to 79.7 $^{\circ}$ F with relative humidity readings ranging from 50.5% to 57.9%. The results of the testing for relative humidity exceeded the US Army guidelines in none of the ten (10) locations tested. Temperature was within the recommended guidelines with the exception of the latrine and room 105, which were found to be higher than the recommended temperature of 79.0 degrees Fahrenheit.

During the survey, CO_2 levels ranged from 403 ppm to 468 ppm within the facility compared to an outdoor CO_2 level of 410 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,110 ppm (410 ppm + 700 ppm). The results of the testing met the ASHRAE guidelines.



Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm <u>)</u>
Office 105	79.7	54.6	442	0
Front Hallway	78.8	55.9	461	0
Office 127	78.8	57.9	468	0
Right Side Hall	78.6	52.3	403	0
Class 117	78.8	53.9	407	0
Left Side Hall	79.7	52.1	442	0
Locker Room/ Range 112	77.9	55.5	436	0
Drill Hall	78.8	53.4	441	0
Gym 120	78.7	50.5	416	0
Latrine 121	79.7	52.1	446	0
Outdoors	85.2	45.3	410	0
Criteria	73.0-79.0	30-50	<1,110	<9.0

IAQ Assessment Summary

Housekeeping within the facility was poor. Carpeting was damaged and deteriorated, HVAC components were found to have significant dust accumulation. HVAC components could not be assessed at the time of the inspection. The HVAC filter of the system located in 106 could not be removed due to the proximity of piping. HVAC components located in the boiler room and gym were found to be in poor condition and laden with dust and debris. Rooms 105, 127 A and 127B as well as 117A were found to contain water impacted ceiling panels. Additionally, site personnel suggest that no maintenance activities have been performed within the facility for over 3 years. HVAC filters were found to contain significant dust loading. Carpeting was found to be in poor condition through the facility.

Air quality samples were collected from Rooms 105, 102 Hall, and 117A as well as outdoors (as control). Samples were collected due to the presence of significant moisture impacted building materials. Indoor fungal spore levels ranged from <28 spores/m³ to 468 spores/m³. The concentration observed outdoors was found to be 11,300 spores/m³. The highest indoor concentration was identified in room 127B.

Location	Concentration	Predominant Genera
Office 105 (Sample 500-4)	468 sp/m ³	Basidiospores
Office 127B (Sample 500-5)	2,450 sp/m ³	Basidiospores
Foyer 102 (Sample 500-6)	413 sp/m ³	Basidiospores
Class 117 (Sample 500-7)	<28 sp/m ³	NA
Outdoors (Sample 500-8)	11,300 sp/m ³	Basidiospores



Based on a review of the analytical data, no amplification of fungal spores was present despite the presence of significant moisture intrusion into the facility.

Suspect Asbestos Containing Building Materials

Suspect asbestos containing materials include sheetrock/joint compound, floor tiles and associated mastic (both 9" x 9" and 12" x 12"), and vinyl covebase. Thermal system insulation was found to be paper wrapped fiberglass with PVC elbows.

Maintenance Bay

The maintenance bay was not found to contain a local exhaust ventilation system which was not operable. The Maintenance Bay is used for vehicle storage and on the day of the site visit was being used as a carpentry shop.

The maintenance bay was found to contain custodial items, tools, waste motor oil, ladders and flammable storage cabinet. The flammable storage cabinet contained various paints and cleaning solvents.

PPE identified in the site included safety glasses and chemical gloves. Materials were kept in good, clean condition.

Ventilation System Assessment

The facility was found to contain three HVAC mechanical systems located throughout the building. All three units were found to be in poor condition. Based on information provided by site personnel, no maintenance activities have been conducted in over three years.

Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicated within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and The El Group, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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



Appendix A

Photographs



Exterior view of facility



Room 105: Water damaged ceiling panels





Hallway (102): Water damaged ceiling panels



Water damaged ceiling tiles: Room 127





View of old firing range. Converted to locker room



Exterior view of facility





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Appendix B Analytical Reports





AMA Analytical Services, Inc.



				Invoice:	95230
Client:	National Guard Bureau	Job Name:	RC 500 Glen Am, MD	Chain Of Custody:	181399
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI	Job Location:	Not Provided	Date Submitted:	10/1/2008
	State Military Reservation	Job Number:	Not Provided	Date Analyzed:	10/8/2008
	Havre de Grace, Maryland	P.O. Number:	Not Provided	Date Invoiced:	10/8/2008
	21078			Person Submitting:	Non-Responsive
Attention:	Non-Responsive				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
								58.00
0881923	500-1	AA Lead Air	5 Day +	\$8.00				40.00
0881924	500-2	AA Lead Air	5 Day +	\$8.00				\$8.00
0881925	500-3	AA Lead Air	5 Day +	\$8.00				\$8.00
0881931	9	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0881932	10	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0881933	11	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0881934	12	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0881935	13	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0881936	14	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0881937	15	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0881926	500-4	MLD Spore Trap	5 Day +	\$30.00				\$30.00
0881927	500-5	MLD Spore Trap	5 Day +	\$30.00				\$30.00
0881928	500-6	MLD Spore Trap	5 Day +	\$30.00				\$30.00
0881929	500-7	MLD Spore Trap	5 Day +	\$30.00				\$30.00
0881930	500- 8	MLD Spore Trap	5 Day +	\$30.00				\$30.00

Sub-Total:	\$230.00
Additional Charge:	\$0.00
Total:	\$230.00

Note: Payment Due Upon Receipt.

May, 2018

Note: All Accounts over 30 days are subject to a 11/2% per month service charge.

* Only apply if additional analysis was performed on the sample(s)

NATLG Account Code:

1

Remit to: P.O. Box 646, Hanover, Maryland 21076, 410-684-3327 Posted to NGB FOIA Reading Room BEST AVAILABLE COPY FOIA Requested

FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 3079 of 5269 4475 Forbes Blvd. • Lanham, MD, 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (501) 459-2643

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratorias, this report of the client to whom it is addressed and upon the is condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written automation provided by the persons submitting them and, unless collected by present of the information. Residual sample material will be discarded in a person submitting them and, unless collected by the cleanstories, the public, and these Laboratories, this report to information. Residual sample material will be discarded in a person submitting them and, unless collected by the cleanstories, we expressly discline any knowledge and liability for the accuration is not be used to claim, and does not imply product certification, approval, or endowment by NVLAP, NIST, or any agency of the Federal Government. All references on the second of the cleanstories is appressible only to polarized light microscopy of Milk A util Covernment. All references and analysical Services, lac.

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 | Air

 | Sample Type | Summary
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 | Job Location: | Job Name: | |
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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCARDITED LA

BEST AVAILABLE COPY
4475 Forbes Blvd. • Lanham, MD, 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fav (301) 459-2643

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This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a neural protection to clients, the public, and these Laboratories, this report guide to the accuracy and 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 as. Sample types, the information provided by the persons abuinting them and, unless otherwise requested by the client. NVLAP, while the analytical samples only to the accuracy and completely and the samples, the performance of the accuracy and completely and the samples are the accuracy and completely of the accuracy of AHERA air samples. This report must not be used to chaim, and does not imply product certification, approval, or endorsement by NVLAP, NNT, or any agency of the Federal Covernment. All rights reserved. AMA Analytical Services, Inc.

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MA Sample Number		Attention:		Address:	Client:		A Spe	IA And
Clicut Sample Number		ntrespon	tinite as Classification	301-JH Old Bay Lane, State Military Reserva	National Guard Burea		- cialized Environme	alytical Se
Analysis Type				Attn: NGB-AVN-SI, tion Jand 21078	Ξ		ntal Laboratory	rvices, In
Sample Type	Summary		P.O. Number:	Job Location:	Job Name:		C	ĩ
Air Volume (L)	of Atomic A		Not Provided	Not Provided	RC 500 Glen /		ERTIFICA	
Area Wiped (ft²)	bsorption .				Аm, MD		TE OF AN	
Reporting Limit	Analysis for Lead		Ectson Submittee Date Analyzed:	Date Submitted:	Chain Of Custod		ALYSIS	
Final Result			ہے ۔ 9/8/2008	9/4/2008	y: 181399			
Comm			Report Date:	-	7			
nents	Page 2 of.		9/8/2008	10920		Environmental Lee See anatoport for details	AIHA	ADITED LABO
	AMA Sample Clieut Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result Comments Number Number (L) (ft ²) Limit	Summary of Atomic Absorption Analysis for Lead Page 2 of AMA Sample Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result Comments Number Number (L) (ff) Limit	Attention: Summary of Atomic Absorption Analysis for Lead Page 2 age AMA Sample Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result Comments Number Number Number Sample Type Air Volume Area Wiped Reporting Final Result Comments	Attention: P.O. Number: Not Provided Date Analyzed: 9/8/2008 Report Date: 9/8/2008 Attention: MA Sample Client Sample Analysis Type Air Volume Area Wiped Reporting Final Result Page 2 of	Address: 301-JH Oid Bay Lane, Atm: NGB-AVN-SI, State Military Reservation Job Location: Not Provided Date Submitted: 9/4/2008 9/4/2008 10920 Havre de Grace, Maryland 21078 Job Number: Not Provided Person Submitting: 9/4/2008 Person Submitting: 9/4/2008 10920 Attention: Image: Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting 9/8/2008 Person Submitting: 9/8/2008 Person Submitting: 9/8/2008 Person Submitting: 9/8/2008 Person Submitting: Person Submitting:	Client: National Guard Bureau Job Name: RC 500 Glen Arn, MD Chain Of Custody: 181 399 VY EL Address: 301-JH Oid Bay Lane, Atm: NGB-AVN-SI, State Military Reservation Job Location: Not Provided Date Submitted: 914/2008 VY EL Have de Grace, Maryland 21078 Job Number: Not Provided Person Submitted: 914/2008 NY EL Attention: Job Summary of Atomic Absorption Analysis for Lead Pase 2 (tr) Comments AMA Sample Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result Comments	Client: National Guard Burean Job Nume: RC 500 Glen Am, MD Chain Of Custody: 181399 100470 Address: 301-HI Old Bay Lane, Am: NGB-AVN-SI, Job Location: Not Provided Date Submitted: 9/4/2008 NY EL Havre de Grace, Maryland 21078 Job Number: Not Provided Provided Person Submitted: 9/4/2008 NY EL Attention: Job Summer: Not Provided Provided Person Submitting: 9/4/2008 Report Date: 9/8/2008 Attention: Summary of Atomic Absorption Analysis for Lead Pioler Sample Type Air Volume Area Wiped Reporting Final Result Piage 2 of AMA Sample Client Sample Analysis Type Sample Type Air Volume Area Wiped Reporting Final Result Piage 2 of	Image: System Environmental Laboratory CERTIFICATE OF ANALYSIS Image: Environmental Laboratory Image: Environmental Laboratory <thimage: environmental="" laboratory<="" th=""></thimage:>

May, 2018

Page 3081 of 5269



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AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 16543

	Analysis Type		Flance		
	Sample 1	lype:	Wipe		
	Analysis	Analysis Date:			
	Result		Percent Recovery	RPD	Comment
Preparation Blank	-0.113	ppm			Acceptable
Report Limit Verification Sample	0 2343	p p m	70 3%		Outside Limits
Expected Spike Level (ppm) 0.3333					
Duplicate Sample 1	4Num ¹	mg/Kg			
Duolicate Sample 2	#Num!	mg/Kg		#1itror	#Error
Matrix Spike Analysis					
Spiked Sample			99.6 9 %		Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample 1	330 27B	4 <u>8</u>	102.38%		Acceptable
Laboratory Control Sample 2	294 439	μg	100 89%	1.47%	Acceptable

Calibration Information

Correlation of Calibration Curve

All calibration verification samples are within acceptance limits.

0.999758

Notes: Recovery for the Report Linux Verification Sample way 70.3%, below the lower control homo of 80%. A passing Report Linux Verification sample for wepe samples for this analysis date can be found with SDC 1654tr (139.02% recovery).

Samples included in this Sample Delive	ery Group (SDG)
----------------------------------------	-----------------

Chain Of Cust	ody — AMA Sample Number	Client Sample Number
181390	81488	1.1
181396	81889	LIA
SDG Namber:	16543	

Page 1 of 2

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181396	\$1890	1.2
181396	81891	1.3
181396	B1892	1.4
181396	81893	15
181396	81894	1.6
181396	81895	L7
181390	81896	[.8
181396	81897	L.9
181396	81898	L 10
81399	81931	Ŷ
181399	81932	10
181399	81933	11
181399	83934	12
181399	81935	13
181399	81936	4
8 30 %	81937	15

SDG Number: 16543

Page 2 of 2



AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 16542

	Analysis Type:		Flame		
	Sample 1	Туре:	Air		
	Analysis	Analysis Date: Result			
	Re			RPD	Comment
Preparation Blank	0.010	ព្រំពា			Acceptable
Report Limit Verification Sample	Q 2686	ppm	107.4%		Acceptable
Expected Spike Level (ppm) 0.25					
Duplicate Sample 1	€Num!	mg/Kg			
Duplicate Sample 2	#Nom!	mg/Kg		#lintor	Wirton
Matrix Spike Analysis					
Spiked Sample			102 73%		Acceptable
Spike Duplicate			99,56%	3.14%	Acceptable
Laboratory Control Sample 1	133 956	ИВ	103.29%	•	Acceptable
Laboratory Control Sample 2	120 145	μe	100.16%	3 07%	Acceptable

Calibration Information

Correlation of Calibration Curve:

All collibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)							
Chain Of Custody	AMA Sample Number	Client Sample Number					
(8285)	81732	\$408]					
182853	81724	84083					
SDG Number: 1	6542						

A 909875

Page 1 of 2

Chain Of Custody	AMA Sample Number	Client Sample Number
182853	81738	84087
182853	81739	84088
503162	81781	QLN-LA-01
503162	81782	OUN-LA-FB1
503158	8t797	H1 N-1.A-01
503158	81798	HLN-LA-FB1
503165	81852	J1N-1.A-01
503165	81853	JTN-LA-FB1
181396	81872	I
181396	81873	2
181396	81874	3
181398	81913	516-1
181398	81914	516-2
181398	81915	516-3
181399	81923	5(0)-1
181399	81924	500-2
181399	\$1925	500-3

Samples included in this Sample Delivery Group (SDG)

SDG Number: 16542

Page 2 of 2



Client:

Address:

Attention:

Client ID

Analyst fD

Alternaria

Ascospores

Boletus

Botrytis

Cercospora

Chaetomium

Coprinus

Curvularia

Epicoccum

Fusarium

Ganoderma

Nigrospora

Pithomyces

Stachybotrys

Stemphylium

Trichoderma

Ulocladium

Zygomycetes

Unknown

Location

Comments

Other Colorless

Hyphal Fragments*

Torula

Rusts

Penicillium / Aspergillus

Cladosporium

Aureobasidium

Basidiospores

AMA Sample #

Collection Apparatus

Sample Volume (L)

Sample Condition

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468 **Totals Spore Concentration**

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Location

Comments

Totals Spore Concentration

2,450

A PLANTED LASORATION



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CERTIFICATE OF ANALYSIS Spore Trap Analysis Report



Client:	National Guard	Bureau			Job	Name:	RC 500 Glen Arn, MD	Ch	ain Of Ci	ustody:	181399
Address:	301-IH Old Bay State Military F	/ Lane, Att leservation	m: NGB-A	VN-SI,	Job	Location:	Not Provided	Da	te Submit	tted:	9/4/2008
	Havre de Grace	, Maryland	i 21078		Job	Number:	Not Provided	Pe	rson Subi	nitting:	Non-Responsive
Attention:	Non-Responsive				P.O	. Number:	Not Provided	Da	te Analyz	æd:	9/8/2008
								Re	port Date	:	
AMA Sample	#		0881928	3			AMA Sample #		0881929	9	
Client ID			500-6	5			Client ID		500-	7	
Analyst ID			RC	2			Analyst ID		RC	2	
Collection Ap	paratus		Allergenco	,			Collection Apparatus		Allergence	5	
Sample Volun	ne (L)		150)			Sample Volume (L)		15	0	
Analytical Ser	sitivity (sp/m³)		28				Analytical Sensitivity (sp/m³)		28	ł	
Sample Condi	tion		Acceptable	e			Sample Condition		Acceptabl	e	
		Raw CT.	%	sp/m	3			Raw CT.	%	sp/m	13
Alternaria		Present		<	28		Alternaria	. '			
Ascospores		Present		<	28		Ascospores				
Aureobasidiu	m						Aureobasidium	· ·			!
Basidiospores	-	5	33.3%		138		Basidiospores		1		
Bipolaris/Dree	chsiera/Helm.						Bipolaris/Drechslera/Helm.	· ·			
Boletus			ļ				Boletus	1	-		
Botrvtis					!		Botrytis				
Cercospora							Cercospora				
Chaetomium		•	`				Chaetomium				·
Cladosporium	1	2	13.3%		55 i		Cladosporium				
Coprinus							Coprinus				
Curvularia							Curvularia				
Epicoccum							Epicoccum				
Fusarium							Fusarium				İ
Ganoderma			ĺ		1		Ganoderma	i i	ĺ		
Nigrospora							Nigrospora				
Penicillium / A	Aspergillus	3	20.0%		83		Penicillium / Aspergillus				
Pithomyces		Present		<	28		Pithomyces				
Rusts							Rusts				
Smuts/Pericon	nia/Myxomycetes	:	'				Smuts/Periconia/Myxomycete	s			
Stachybotrys		' 					Stachybotrys	: . 			i
Stemphylium		:	I.		;		Stemphylium				
Trichoderma		:	1				Trichoderma		:		
Torula							Torula				
Clocladium							Clociadium				
Zygomycetes		:					Zygomycetes				
Other Colorie	\$\$	4	26.7%		110		Other Colorless		1		
Unknown		1 -	6.7%		28		Unknown	· ·			
Hyphal Frage	nents*	7			193		Hypnal Fragments"		i		
			1						Ì		
Totals Spore	Concentration				413		Totals Spore Concentration		<	:	28
Location							Location				
Comments							Comments				
							No Visble Trace. No Mold Spores Detected.				

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Page 2 of 4



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CERTIFICATE OF ANALYSIS

Spore Trap Analysis Report



Client:	National Guard Bureau	Job Name:	RC 500 Glen Arn, MD	Chain Of Custody:	181399
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:	Non-Responsive
Attention:	Non-Responsive	P.O. Number:	Not Provided	Date Analyzed:	9/8/2008
				Report Date:	

AMA Sample #		0881930		
Client ID		500-8		
Analyst ID		RC		
Collection Apparatus		Allergenco		
Sample Volume (L)		150	J	
Analytical Sensitivity (sp/m ³)		41		
Sample Condition		Acceptable	;	
1	Raw CT.	%		sp/m³
Alternaria	3	1.1%		124
Ascospores	39	14.2%		1,610
Aureobasidium				
Basidiospores	105	38.3%		4,340
Bipolaris/Drechslera/Helm.				
Boletus				
Botrytis				
Cercospora	Present		<	41
Chaetomium		!		
Cladosporium	100	36.5%		4,130
Coprinus				
Curvularia	Present		<	41
Epicoccum	Present		<	41
Fusarium	1	0.4%		41
Ganoderma	1	l .		
Nigrospora				
Penicillium / Aspergillus	8	2,9%		330
Pithomyces	Present		<	41
Rusts		:		
Smuts/Periconia/Myxomycetes	1	0.4%:		41
Stachybotrys		! •		
Stemphylium				
Trichoderma				
Torula				
Goeladium				
Zygomycetes				
Other Coloriess	17	6.2%		702
Unknown	:			
Hyphal Fragments*	1	1		41
		•		11.204
Totals Spore Concentration				11,300

Location

Comments



A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS Spore Trap Analysis Report

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				Report Date:	
Attention:	Non-Responsive	P.O. Number:	Not Provided	Date Analyzed:	9/8/2008
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	Non Responsive
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Not Provided	Date Submitted:	9/4/2008
Client:	National Guard Bureau	Job Name:	RC 500 Glen Am, MD	Chain Of Custody:	181399

General Comments, Disclaimers, and Footnotes

Analytical Method	1:	Sample are analyzed following the instructions and guidelines outlined in AMA Analytical Services, Inc. SOP 901.
Sample Condition:	:	Acceptable: The sample was collected and delivered to the our location without disturbing the material on the sampling media.
		Unacceptable: 1. The sample is overloaded with material. 2. The sample trace has been disturbed. 3. The sample was not collected properly.
		Obscured: The loading on the sample is high, possibly obscuring spores present. The quantity reported should be considered the minimum concentration present. The actual concentration may be higher than the reported concentration.
Spore Notes:		Based on their small size and very few distinguishing characteristics, Aspergillus and Penicillium cannot be differentiated by non-viable sampling methods. There are other types of spores whose morphology is similar to Aspergillus and Penicillium and cannot be differentiated by non-viable sampling methods. Examples of these similar spores are Acremonium, Paecilomyces, Wallemia, and Trichoderma.
		Smut, Periconia and Myxomycetes are three different types of organisms that have similar morphological characteristics.
		Bipolaris/Dreschlera/Helm: Bipolaris / Dreschlera / Helminthosporium group.
		Other Colorless represents all colorless spores that are non-distinctive and unidentifiable.
	*	Hyphal Fragments: A portion of the mycelium that becomes separated from the remainder of the thallus (vegetative body), each of which has the capacity to grow and form new individuals. Results for hyphal fragments are in fragments/m ³ and are not incorporated in the total spore concentration.
Quantification:		Analytical Sensitivity (A.S.): This is dependent on the volume of air collected and the amount of the trace that was analyzed.
		The value of "Present" indicated in the Raw Count column represents the presence of this spore type during the preliminary exam at 400x. The Raw Count converts to a whole number if the spore type is encountered again during the 1,000x enumeration. The sp/m ³ concentration will be reported as less than the analytical sensitivity if "Present" is reported in the Raw Count.
		Due to rounding, totals may not equal 100%
		sp/m ³ : Spores per cubic meter.

Results are reported to 3 significant figures.

Rolenda Chuyate

Totenthe Mungall -

Analyst

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.

An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory Posted to NGB EOIA Reading Room May, 2018 Forbes BIVE: Lannam, MD, 20706 (301) 459-2646 Polly Free (800) 59(A(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Boguested)(Bogueste Monday, September 08, 2008 Page 3089 of 5269

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 3091 of 5269

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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 Glen Arm (Gunpowder) Readiness Center

Prepared For:	National Guard Bureau Region North IH
	301-IH Old Bay Lane
	Havre de Grace, MD 21078
Survey Location:	Glen Arm (Gunpowder) Readiness Center
25	10901 Notchcliff Road
	Glen Arm, MD 21057
Prepared By:	Compliance Management International, Inc.
	1215 Manor Drive
	Suite 205
	Mechanicsburg, PA 17055
Survey Date:	May 31, 2013
Report Date:	June 24, 2013





Table of Contents

Section 1.0 Executive Summary
Section 2.0 Operation Description & Observations
Section 3.0 Lead Testing
Section 4.0 Lighting
Section 5.0 Indoor Air Quality
Section 6.0 Suspect Asbestos Containing Building Materials
Section 7.0 Equipment 11
Section 8.0 Limitations
Appendix A. Laboratory Analysis Report
Appendix B. Photographs
Appendix C. Floor Plan
Appendix D. References

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on May 31, 2013, at the Glen Arm (Gunpowder) Readiness Center located at 10901 Notchcliff Road, Glen Arm, MD 21057. The survey was performed by Mr. Non-Responsive.

- 1. Lead surface and air samples were collected. Sample results were all within regulatory standards or recommended guidelines. See Section 3.0 for detailed sampling results.
- 2. Lighting levels met the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in all locations evaluated. See Section 4.0 for detailed findings.
- 3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.
 - a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in areas sampled.
 - b. The relative humidity levels met the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in areas sampled.
 - c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 ppm.
 - d. Carbon dioxide (CO_2) levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings.

See Section 5.0 for detailed sampling results.

4. Water-stained ceiling tiles were observed in the facility. A water leak was noted in the Drill Hall. See Section 5.0 for detailed findings.

Section 2.0 Operation Description & Observations

The Glen Arm (Gunpowder) Readiness Center is mainly an administrative facility with a drill hall, offices, and classrooms. At the time of the inspection only one person was present at the facility. He limited inspection access to the foyer, drill hall, main hallway, copy room, kitchen, and one classroom.

The building was been built in 1974. It is a one-story structure. The exterior is constructed concrete. The interior walls are concrete block and drywall. The floors are concrete, carpet, 12"X12" floor tiles.

There is a forced air, ducted system that provides heating and cooling to the building.

It did not appear that there was any daycare at this facility.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared to be properly designed. Personnel had supportive chairs.

Housekeeping practices were adequate.

Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 micrometer (um) mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Sample #	Location	Air ug/m ³	Surface ug/ft ²
1	Drill Hall	<6.7	*
2	Classroom 117-A	<6.7	*
3	Drill Hall – Floor	*	<110
4	Drill Hall – Top of Coke Machine	*	140
5	Drill Hall – Top of Elliptical Machine	*	<110
6	Kitchen – Top of Microwave	*	<110
7	Kitchen – Counter Top	*	<110
8	Left Hallway – Floor	*	<110
9	Foyer – Top of Computer	*	<110
10	Copier Room – Top of Desk	*	<110
11	Classroom 117-A – Top of Table	*	<110
12	Blank – Wipe	*	<12 ug
13	Blank – Air	<3 ug	*
-	Criteria	50	200

Lead Testing Results Summary

Table Notes:

- 1. **Bolded** results exceed listed criteria
- 2. **ppm** = parts per million
- 3. ug/ft^2 = micrograms per square foot
- 4. $ug/m^3 = micrograms per cubic meter$
- 5. **ug** = micrograms

Sources:

- 1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges
- 2. OSHA 29CFR1910.1025 Lead Standard

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 "Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Lead surface and air samples were collected. The following is a summary of the sample results from this survey.

- Surface levels of lead were below the recommended guideline of 200 ug/ft² in all locations tested.
- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m³).
- No chipping or peeling paint was observed.

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.

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Drill Hall	31.8	10	Yes
Foyer	55.3	10	Yes
Copier Room	45.0	10	Yes
Left Hallway	30.4	5	Yes
Classroom 117-A	158.4	50	Yes
Men's Bathroom	30.5	5	Yes
Kitchen	77.0	50	Yes

Light Survey Assessment Summary

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 meet the minimum recommended guidelines in all areas accessible.

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.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Drill Hall	77.8	59.8	462	*2.6
Outdoors	84.1	59.3	327	0
Criteria	68-79	30-60	<1,027	<9

IAQ Assessment Summary

Table Notes:

- 1. **Bolded** results exceed listed criteria
- 2. **ppm** = parts per million
- 3. (%) = percent relative humidity
- 4. $^{\circ}\mathbf{F} = \text{degrees Fahrenheit}$
- 5. * A four wheeler type vehicle was driven into the drill hall.

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements were within the recommended guideline of 68-79°F in all sampled areas.
- Relative humidity levels were within the recommended guideline of 30-60% in all sampled areas.
- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level for this

survey. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,027 ppm. This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide
- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. The following observations were noted:
 - Water-stained/damaged ceiling tiles were observed in the foyer and main hallway.
 - A water leak was present in the drill hall. A garbage can was collecting water runoff from the leak.

Section 6.0 Suspect Asbestos Containing Building Materials

The following suspect asbestos-containing material (ACM) was observed at the time of this survey:

1. No suspect ACM was observed in the areas inspected.

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98011EL	11/2012	NA
SKC Air Sampling Pump	647598	5/31/13	2.5 LPM
SKC Air Sampling Pump	648349	5/31/13	2.5 LPM

Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

Appendix A. Laboratory Analysis Report

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

Au AIHA (#100470) and NY ELAP (#10920) Accredited Laboratory

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May, 2018

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Client: Address:

National Guard Bureau

301-IH Old Bay Lane, Attn: ARNO-CJG-P,

Job Location:

Glen Arm, MD Glen Arm RC

Date Submitted: Chain Of Custody:

6/4/2013

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LAB 4100470

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LAP, LUC

Job Name:

Havre de Grace, Maryland 21078 State Military Reservation

P.O. Number:

W912K6-09-A-0003 Not Provided

Date Analyzed: Person Submitting

6/11/2013

Report Date:

6/11/2013

Job Number:

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CERTIFICATE OF ANALYSIS



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Page 3106 of 5269

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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 tability for the accuracy and completeness of or eudorsement by NY ELAP, AIHA, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc. his information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval 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, 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 change unless signed by the Technical Director or Deputy All results are to be considered preliminary and subject to supplied information nor verified by this laboratory. Final results for air and wipe samples are based on client Air and Wipe results are not corrected for any blank results should not be considered when interpreting the result. Note: All results have two significant digits. Any additional digits shown %Pb = percent lead on a dry weight basis N/A = Not Applicable Analysis Method For Furnace: Air, Wipes, Paints, and Soli/Solids : EPA 600/R-93/200(M)-7010; Water: SM-31138 Note: All samples were received in good condition unless otherwise noted the free to mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm) 1000 ug = micrograms ug/L = parts per billion (ppb) Analysti S. Ohinnapad / K. Shipe associated with these samples. **Technical Manager:** G Edward Carney

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Posted to NGB FOIA Reading Room May, 2018

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Appendix B. Photographs

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Drill Hall



Drill Hall leaking pipe garbage can collecting water

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Water stained and damaged ceiling tiles in the foyer



Exterior of facility

Appendix C. Floor Plan



Appendix D. References

- 1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead.
- 2. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values and Biological Exposure Indices, 2011 Edition.
- 3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition.
- 4. American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2010.
- 5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.
- 6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.
- 7. National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.
- 8. National Ambient Air Quality Standards (NAAQS) National primary ambient air quality standards for carbon monoxide 40 CFR 50.8.
- 9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h) (3)].
- 10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM).
- 11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.
- 12. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.
- 13. ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.

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DEPARTMENT OF THE ARMY US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

23 FEBRUARY 2006

MEMORANDUM FOR Region North Industrial Hygiene Office (NGB-AVS-SI-IH/ Ms. Non-Responsive), Army National Guard Bureau, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities, Industrial Hygiene Baseline Survey, First Regiment Armory, Glen Burnie, MD, Report No. 55-ML-01ED-03/06

1. Enclosed is the final copy of the subject report and two CD-ROMs.

4. Our point of contact is Ms. Non-Responsive, at commercial (410) 436-5475/3118, DSN 584-5475/3118 or electronic mail: Non-Responsive @us.army.mil

FOR THE COMMANDER:



Director, Occupational Health Sciences

Encl

Readiness thru Health



FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 3115 of 5269 BEST AVAILABLE COPY

U.S. Army Center for Health Promotion and Preventive Medicine







INDUSTRIAL HYGIENE BASELINE SURVEY REPORT NO. 55-ML-01ED-03/06 MARYLAND ARMY NATIONAL GUARD FIRST REGIMENT ARMORY GLEN BURNIE, MD 23 JULY 2003







Approved for public release; distribution unlimited



Readiness Thru Health

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DEPARTMENT OF THE ARMY US ARMY CENTER FOR HEALTH PRONOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND ND 21010-5403

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EXECUTIVE SUMMARY INDUSTRIAL HYGIENE BASELINE SURVEY REPORT NO. 55-ML-01ED-03/06 MARYLAND ARMY NATIONAL GUARD FIRST REGIMENT ARMORY GLEN BURNIE, MD 23 JULY 2003

1. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard (MDARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions.

2. CONCLUSIONS.

a. <u>Lead Exposure</u>. Levels of lead in dust that exceeded safe limits for adults and children were identified. These levels may result in health hazards to adults and to children visiting the Armory, Personnel working in the Armory may have been tracking dust containing lead throughout the facility. Cleaning areas with elevated levels of lead in dust may further prevent lead from becoming redistributed throughout the Armory.

b. <u>Asbestos</u>. There was a potential for exposure to asbestos in the Armory. A site Asbestos Management Program (AMP) Plan was not found. The Conference Room had areas of deteriorated and missing tile flooring, which may have been asbestos-containing building material (ACBM).

c. Safety Hazards. There were loose ceiling tiles in the Conference Room ceiling.

3. RECOMMENDATIONS.

a. <u>Lead Exposure</u>. Health Hazard Risk Assessment Code (RAC) 3. Develop and implement a lead hazard management plan for the Armory. 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 (USACHPPM) recommended levels. Address all potential lead hazards before continuing to extend the use of this facility to children. If children will visit this facility, clean the floors in the Drill Hall and Classroom to the Environmental Protection Agency lead in dust standards for young children, and clean other horizontal surfaces in the Drill Hall and Conference Room to the NGB Region North and USACHPPM recommended level for lead in dust on frequently contacted surfaces. Ensure that personnel wear disposable gloves and

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disposable coveralls as extra protection when working in all areas identified as having elevated levels of lead. Follow the cleaning guidelines in Appendix D. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after clean up.

b. <u>Safety</u>. Safety RAC 4. Replace the damaged ceiling tiles and damaged floor tiles. See paragraph c below concerning the floor tiles.

c. Asbestos Exposure. Health Hazard RAC 4 if asbestos is present.

(1) Review the 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 Glen Burnie Armory.

(2) Perform an asbestos survey if no records are located. Determine whether the floor tiles are ACBM.

(3) If asbestos is found, develop and implement an AMP if there is not one for the Armory. If the damaged floor tiles are ACBM, ensure that they are replaced in accordance with the AMP.

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TABLE OF CONTENTS

PA	RAGRAPH	Page
1.	REFERENCES	İ
2.	PURPOSE OF EVALUATION	1
3.	AUTHORITY	1
4.	BACKGROUND INFORMATION	11
5.	FACILITY EVALUATION	1
6.	ASSESSMENT CRITERIA FOR LEAD	2
7.	SAMPLING RESULTS, DISCUSSION, AND CONCLUSIONS	3
8.	RECOMMENDATIONS	6
9.	ADDITIONAL ASSISTANCE	7
АР	PENDICES	
Α.	REFERENCES	A-l
В.	ASSESSMENT CRITERIA FOR LEAD	B -1
c.	SAMPLING SHEETS AND LAB ANALYSES	Ç-1
D.	CLEANING GUIDELINES FOR LEAD	D-1
E.	SITE MAP	E-1

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INDUSTRIAL HYGIENE BASELINE SURVEY REPORT NO. 55-ML-01ED-03/06 MARYLAND ARMY NATIONAL GUARD FACILITIES FIRST REGIMENT ARMORY GLEN BURNIE, MD 23 JULY 2003

1. REFERENCES. See Appendix A.

2. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard (MDARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions. This survey will serve as a baseline so that an occupational exposure history can be compiled for each civilian or military employee.

3. AUTHORITY. Fax, National Guard Bureau Region North Industrial Hygiene Office (NGB-AVS-SI-IH/Ms. Non-Responsive), 28 February 2003, subject: SAB.

4. BACKGROUND INFORMATION.

a. <u>Armory Background Information</u>. The Armory resident unit is the First Regiment. The approximate date of construction was 1940.

b. <u>Armory Use by Children</u>. The manager stated that the Armory was used for family functions. We informed the National Guard Bureau (NGB Region North Industrial Hygiene Office) of the high lead in dust sample results. The NGB requested that children not occupy the facility until all the facility was cleaned and retested. As of 2005, the Maryland Military Department was advertising Glen Burnie Armory as available for rental for activities that include young children. We do not know whether the facility had been cleaned and retested.

c. <u>Point of contact (POC)</u>. The POC was the manager, SFC Non-Responsive, 14 Dorsey Road, Glen Burnie, MD 21061-3203.

5. FACILITY EVALUATION.

a. Physical Condition of Facilities.

(1) Paint. The age of the building indicated that the presence of lead-based paint (LBP) was likely. Some rooms in the Armory had extensive areas of deteriorated paint. Staff Sergeant Ruth McCuen, Environmental Compliance Assessment Coordinator for the Maryland NGB, stated that there were no records of lead abatement in this facility.

(2) Asbestos. We were not able to determine whether an asbestos inspection or abatement had ever been conducted at the Armory. A site Asbestos Management Program Plan was not found. The Conference Room had areas of deteriorated and missing tile flooring, which

may have been asbestos-containing building material (ACBM). The MDARNG State Occupational Health Nurse, LTCNON-Responsive, was notified. LTCNON-Responsive stated that the MDARNG Facilities Main Office would investigate this finding.

(3) Mold and Moisture Problems. No mold or moisture problems were observed.

(4) Safety Hazards. There were loose ceiling tiles in the Conference Room ceiling.

(5) Indoor Firing Range (IFR). The firing range had been closed, and was being used as a gym. No records of cleaning or lead abatement in the IFR could be located.

b. Safety and Occupational Health Programs. We could not locate lead or asbestos management plans in the facility. No other safety or occupational health plans were required to be present in the facility.

c. Heating, Ventilation, and Air-conditioning Systems. The building was heated with ceiling mounted units.

d. Noise Dosimetry. No operations with the potential to generate hazardous noise levels were identified.

e. Lighting. All areas appeared to be adequately lit and occupants reported no areas of deficient lighting.

6. ASSESSMENT CRITERIA FOR LEAD. See Appendix B.

a. <u>Lead in Air</u>. The Army complies with the Occupational Safety and Health Administration 8-hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter (μ g/m³) of air.

b. Lead in Dust.

(1) The Environmental Protection Agency (EPA) and State of Maryland limits for lead in dust are 40 μ g/ft² on floors, 250 μ g/ft² on window sills, and 400 μ g/ft² 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.

(2) The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) applies these limits to areas of Army National Guard facilities that children may occupy, regardless of the amount of time that children occupy them.

(3) The NGB Region North concurs with the USACHPPM recommended safe limit of 200 μ g/ft² on floors and surfaces frequently contacted by facility employees, which is more stringent for window sills than the EPA/State standards.

c. <u>Lead in Paint</u>. Paint containing lead levels of 0.5 percent or more by weight in dried solid (also reported as 5000 milligrams per kilogram) is considered to be LBP according to both Federal and Maryland State Regulations. Paint containing lead levels of more than 0.7 milligrams per square centimeter is considered to be LBP according to Maryland State Regulations. In Army Regulation 420-70, Buildings and Structures, lead-contaminated paint (LCP) is defined as any paint containing detectable amounts of lead. The Army considers LCP to be potentially hazardous to children if it is disturbed or deteriorating.

d. <u>Lead Carcinogenicity</u>. The Department of Health and Human Services National Toxicology Program (NTP) released the Report on Carcinogens, Eleventh Edition in February 2005. The NTP report lists "lead and lead compounds" as "reasonably anticipated to be human carcinogens."

7. SAMPLING RESULTS, DISCUSSION, AND CONCLUSIONS.

a. <u>Lead in Dust</u>. Lead in dust sample locations and analytical results are shown in the Table 1. Sample results greater than 40 μ g/ft² for floors or 200 μ g/ft² for other surfaces are highlighted. High levels of lead were found on the Conference Room file cabinet (486 μ g/ft²) and the Conference Room window sill (527 μ g/ft²).

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Result (µg/ft [*])	госяно областивая в в с в с в с в с в с в с в с в с в с	Wipe Sample Wamber
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٤٢>	Toot Tiget	<u>GBW02</u>
<33	Gym Floor	CBM03
٤٢>	Cym Floor	GBM04
<73	Cym Floor	CB/M02
	Conference Room/Top of File Cabinet	GBM09
<23	Conference Room Desk	CBM01
53	Conference Room Desk	6BW08
	Conference Room/Window Sill	CBM09
52>	Drill Room Floor	CBM10
	Drill Room Floor/Next to Garage Entrance	CBW11
572	NCO CIPP	CIMED
<u> </u>	Hallway	CBM13
57>	Second Floor Locket Top	CRAIT
52>	Second Floor Latrine	CRAIN
<u> </u>		
		/1840
<u> </u>		CBW18

Table 2 Inie9 ni bes.1

Besult (%)	Location of Samples	əlqms2 əqiW
		Литрег
0.324	Conterence Room/Wall i	GB Bulk-1
969'0	Conterence Room/Wall 2	GB Balk-2
845.0	Hallway	CB B ^a lk-3



Photograph 1. Converted IFR/Classroom



Photograph 2. Converted IFR/Gym



Photograph 3. Converted IFR/Gym



Photograph 4. Conference Room, Asbestos Floor Tiles







Photograph 6. Hallway, Deteriorated Lead Paint

Four lead in dust sample results exceeded the EPA and State of Maryland limits for young children. One lead in dust result exceeded the OSHA compliance letter recommended level for lead in dust on clean surfaces that has been adopted by NGB Region North and USACHPPM. There were very high levels of lead dust on the window sill in the Conference Room. Personnel working in this room were potentially exposed to lead, and may have been tracking lead out of the area and redistributing it into adjacent rooms in the Armory. This can result in lead exposures for the general workforce and for children visiting this facility. Three lead in dust sample results exceeded the EPA and the State of Maryland lead exposure standard for children of 40 μ g/ft² on floors and 250 μ g/ft² on window sills. These levels are hazardous to children exposed to lead dust through physical contact, inhalation, or ingestion while visiting the Armory.

b. <u>Lead in Paint</u>. See Table 2 for sample locations and results. Three bulk samples of deteriorated paint were collected for lead analysis. The results ranged from 0.324 percent to 0.696 percent lead in paint. All paint samples were LCP and the latter one was LBP. Deteriorated LBP and LCP are a potential hazard for employees and for children.

c. <u>Asbestos</u>. There was a potential for exposure to asbestos in the Armory. Damaged floor tiles that may have been ACBM may become friable and release asbestos fibers, resulting in exposure to Armory occupants. This should be confirmed by Armory records or by sampling. Army policy requires the Armory to establish and execute an AMP for any asbestos in the facility, and to take immediate corrective action where a possible asbestos hazard has been identified.

8. RECOMMENDATIONS. The Department of Defense Instruction 6055.1 provides Risk Assessment Codes (RACs) for health hazards, a procedure which allows assessment of the magnitude of exposure to physical, chemical, and biological agents and the possible medical

effects of exposure. The RAC is an expression of the risk associated with the hazard and combines the hazard severity and accident probability into a single number. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

a. <u>Lead Exposure</u>. Health Hazard RAC 3. Develop and implement a lead hazard management plan for the Armory. Clean horizontal surfaces in the administrative areas to the NGB Region North and USACHPM recommended levels. Address all potential lead hazards before continuing to extend the use of this facility to children. If children will visit this facility, clean the floors in the Drill Hall and Classroom to the EPA lead in dust standards for young children, and clean other horizontal surfaces in the Drill Hall and Conference Room to the NGB Region North and USACHPPM recommended level for lead in dust on frequently contacted surfaces. Ensure that personnel wear disposable gloves and disposable coveralls as extra protection when working in all areas identified as having elevated levels of lead. Follow the cleaning guidelines in Appendix D. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after clean up.

b. <u>Safety</u>. Safety RAC 4. Replace the damaged ceiling tiles and damaged floor tiles. See paragraph c below concerning the floor tiles.

c. Asbestos Exposure. Health Hazard RAC 4 if asbestos is present.

(1) Review the 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 Glen Burnie Armory.

(2) Perform an asbestos survey if no records are located. Determine whether the floor tiles are ACBM.

(3) If asbestos is found, develop and implement an AMP if there is not one for the Armory. If the damaged floor tiles are ACBM, ensure that they are replaced in accordance with the AMP.

10. ADDITIONAL ASSISTANCE. For additional assistance or questions concerning this report, please contact the undersigned at DSN 584-3118, commercial 410-436-3118, or by electronic mail:



Industrial Hygienist USACHPPM Lead and Asbestos Team Leader Industrial Hygiene Field Services Program

APPROVED:



Administrative Program Manager Industrial Hygiene Field Services Program

Posted to NGB FOIA Reading Room May, 2018

MDARNG IH Baseline Surveys, Glen Bernie, MD, Report No. 55-ML-01ED-03/06

APPENDIX A

REFERENCES

1. Title 29, Code of Federal Regulations (CFR), Parts 1910 and 1962, 2005 rev. http://www.osha.gov/comp-links.html

 Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program, 19 Aug 98. http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf

3. AR 40-5, Preventive Medicine, 22 July 2005. http://www.usapa.army.mil/pdffiles/r40_5.pdf

4. AR 385-10, The Army Safety Program, 29 Feb 00. http://www.usapa.army.mil/pdffiles/r385_10.pdf

5. DA PAM 40-503, Medical Services, Industrial Hygiene Program, 30 Oct 00. http://www.usapa.army.mil/pdffiles/p40_503.pdf

6. American Conference of Governmental Industrial Hygienists (ACGIII), Threshold Limit Values (TLVs) and Biological Exposure Indices (BEls), ACGIH, Cincinnati, OH, 2005. http://www.acgih.org/TLV/

7. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 62-2002, Ventilation for Acceptable Indoor Air Quality, Atlanta, GA, 2002. http://www.ashrae.org

8. Illumination Engineering Society of North America, American National Standard Practice for Office Lighting, ANSI/IESNA RP-1-1993.

9. USACHPPM Interim Report No. 39-EJ-1157-99, Derivation of Wipe Surface Screening Levels for Environmental Chemicals, 1999.

10. OSHA Instruction, CPL 02-02-058 - CPL 2-2.58 - 29 CFR 1926.62, Lead Exposure In Construction; Interim Final Rule Inspection and Compliance, Procedures, 1993. http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=1570

11. U.S. Department of Housing and Urban Development (BUD), Technical Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, 1998. http://www.hud.gov/offices/lead/guidelines/hudguidelines/index.cfm

A-1

MDARNG Facilities IH Baseline Surveys, Glen Burnie, MD, Report No. 55-ML-01ED-03/06

APPENDIX B

SUBJECT: National Guard Bureau Region North Industrial Hygiene Office Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 μ g/ft². This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. The EPA standards (40 CFR 745.227(e) (8) (viii)) and State of Maryland standards are not directly applicable because they are developed for floors (40 μ g/ft²), windowsills (250 μ g/ft²) and window troughs (400 μ g/ft²) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. The OSHA has no specific requirement for work area surfaces. The OSHA lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. The OSHA cites a level of 200 μ g/R² 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 μ g/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 hygicnic 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 μ g/m³ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

B-1

MDARNG Facilities IH Baseline Surveys, 1st Regiment Armory, Glen Burnic, MD Project No. 55-ML-01ED-03

APPENDIX C

SAMPLING SHEETS AND LAB ANALYSES

C-1

Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211 (303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

> Laboratory Code: Subcontract Number:

Laboratory Report:

Project Description:

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USACHPPM USACHPM, ATTN: MCHB-TS-OFS Bldg 1570 APG MD 21010

Dear Customer,

August 8, 2003

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 95872-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you should have any questions about this report, please feel free to call me at 303-964-1986.

Sincerely, Non-Responsive President

Page 1 of 3

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 3131 of 5269

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RES 95872-1

None given None given

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896 AIHA Certificate of Accreditation #480 LAB ID 101533

TABLE ANALYSIS: LEAD IN PAINT

RES Job Number:	RE5 95872-1
Client:	USACHPPM
Client Project Number / P.O.:	None given
Client Project Description:	None given
Date Samples Received:	July 25, 2003
Analysis Type:	USEPA SW846 3050B / AA (7420)
Turnaround:	3-5 Day
Date Samples Analyzed:	August 8, 2003

Client	Lab	Detection	LEAD		
JD Number	JD Number Limit		CONCENTRATION		
		(%)	(%)		
GB Bulk-1	EM 798809	0.005	0.324		
GB Bulk-2	EM 798810	0.005	0.696		
GB Bulk-3	13M 798811	0.005	0.348		



Page 3 of 3



Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211 (303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

REMIT TO: 2059 Bryant St. Denver, CO 80211

Invoice to:

MD National Guard Bureau 301-IH Old Bay Lane Havre De Grace MD 21078 Invoice Date: Invoice Number: August 8, 2003 95872-1

TERMS:

Net 30 Days

Service Charge of 18% per annum may by charged on past due invoices.

Quantity	Analytical Procedure				Unit Price	Amount
25	RES Job #: Desc: Submitted By: P/O No: Contact: AA/ICP Metal	95872-1 None given MD National Gi None given <mark>Non-Responsive</mark> Wipe	uard Bureau 3-5 Dav	4125-02	\$7.50	\$187.50
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	Invoice Total: \$187.50					

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Posted to NGB FOIA Reading Room May, 2018

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MDARNG Facilities 1H Baseline Surveys, 1st Regiment Armory, Glen Burnie, MD Project No. 55-ML-01ED-03

APPENDIX D

CLEANING GUIDELINES FOR LEAD

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CHAPTER 14: CLEANING

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6L-61	4, Worker Protection Measures		
91-61	3. Exterior Cleaning		
81-61	2. Small Debris		
81-11	1. Large Debris		
81-11	Cally Cleaning Procedures	\mathbf{C}^{\prime}	
81–4I	Cingoing During During add and goines() and	Β.	
91-11	Precleaning Procedures	Ψ.	
91-4I	t Procedures During Lead Hazard Control	Q,	Άł
9L-V	F		
11-6	3. The HEPA/Wet Wash/HEPA Cycle		
14-8	2. Wet Detergent Wash		
1-+1	Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Participation Pa		
1-7L	Cleaning Techniques		
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L-71	Containing the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second se	Ά	
L-Þ1	sering bre spottem prints	CIE	.01
2-01	Waste Disposal	.э	
9-7l	Equipment Needed for Cleaning	Έ	
9-7L	Checklist	.A	
9-ÞL	ordination of Cleaning Activities	იე	'II
9-7L	4. Deadlines.		
9-71	3. High Dust-Producing Methods and/or Insdequate Containment		
9-ÞL	2. Worker Inexperience		
5-7L	T. Low Clearance Suandards		
9-\$L	Difficulties in CleanD ni seithcult	·ɔ	
5-41	Small Dust Particles	. Ө	
\$-\$L	Performance Standard	٠¥	
9-4L	notion	ւսլ	.1
C_+-	summe dese-λι	a-da	are
5-41	1000000 10 10 10 10 10 10 10 10 10 10 10	-	-+3

- Chapter 14: Cleaning — -

V.	/ Order of Final Cleaning Procedures After			
	Lead Hazard Control	4-19		
	A. Final Cleaning	4-19		
	1. Decontamination of Workers, Supplies, and Equipment	4-19		
	B. Pretiminary Visual Examination	4-20		
	C. Surface Painting or Sealing of Nonfloor Surfaces	4-20		
	D. Final Inspection	4-20		
	E. Recleaning After Clearance Failure	4–20		
VI	. Cleaning Cost Considerations	4-21		
	A. Initial Clearance Test Failure Rates	421		
	B. Key Factors In Effective Cleaning	421		
	C. Special Problems	4-21		
VI	I. Alternative Methods	4-22		
	A. Vacuums	4-22		
	B. Trisodium Phosphate and Other Detergents 14	4-22		

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- 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.
- 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 vacuum-ing step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clear-ance criteria are met and workers are not overexposed.
- 11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
- 12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
- 13. Paint or otherwise seal treated surfaces and interior floors.
- 14. Conduct a clearance examination (see Chapter 15).
- 15. If clearance is not achieved, repeat the final cleaning,



- 16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.
- 17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.
- 18. Cleaning equipment list:
 - HEPA vacuums.
 - Detergent.
 - Waterproof gloves.
 - Rags.
 - Sponges.
 - Mops.
 - Buckets.
 - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
 - 6-mil plastic bags.
 - Debris containers.
 - Waste water containers.
 - Shovels.
 - Rakes.
 - Water-misting sprayers.
 - 8-mil polyethylene sheeting (or equivalent).

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris and dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning

procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove all leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hezard work is as follows:

- 100 µg/ft² on floors.
- 500 µg/ft² on interior window sills (stools).
- 800 µg/ft² on window troughs (the area where the sash sits when closed).
- 800 يوز ft² on exterior concrete.

These levels are besed on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

2. Worker Inexperience

To understand the level of cleantiness 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 stoppy 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).

14 - 6



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) fifter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that finedust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA (ilters 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 raduction 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 vacuomed 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.

14 - 8



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and prefilter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the prefilter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a highphosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several



Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

14-9



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 detargent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wetwash process.

Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 3145 of 5269





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 toifet (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.





- Next, the area is washed down.
- After drying, the area is again HEPA vacuomed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining dobris 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.

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.

Single-Pass Wet Wash/HEPA Vacuum

Some tead 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. White 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.





Powered Carpet Beater



Wheeled Floor Nozzle

14-13

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Wash all surfaces with suitable detergents

Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces



Wet Mop Floor



Don't Dry Sweep





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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 3150 of 5269

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. Seating Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the





Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

Wet HEPA Vacuum

Cleaning Agent

Container

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



Cleaning Agent

Dispenser and

Vacuum Nozzle

Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

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belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will



Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the antire 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 property. The swept debris should be placed in double 4-mit or single 6-mit polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overtoaded 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 Chepter 8). Because weather can adversely affect the efficacy of exterior

14-18



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 δ 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 plasticremoval 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 mopheads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

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Figure 14.8a Pick Up Corners of Plastic Sheeting.



Figure 14.85 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 fead 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 chatlenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleantiness.

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

14 - 21

option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags. send a steady stream of fine particles into the air, while vacuums with partially filled bags. were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without

increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dustretaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

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%
Silis	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.

Mass Removal Efficiency Percentages **Cycle Number Cleaning Method** Central Central **HEPA Vacuum** Portable Vacuum---Plain Vacuum—Agitator Vacuum—Plain Read Tool Tool 17.5 34.7 71.0 55.4 1 2 47.0 80.2 61.2 23.03 51.9 85.9 66.3 26.6 4 56.0 87.8 67.0 29.4 59.3 68.9 32.5 5 72.1 74.4 61.6 91.2 34.9 6 7 63.B 93.1 76.4 36.5 8 67.5 77.5 38.1 95.4 9 67.5 97.7 78.7 40.1 10 67.2 100.0 80.2 41.7 80.2 41.7 11 102.3 12 104.6 84.1 44.8 104.6 13 84.5 46.8 103.8 14 84.5 48.4 15 49.6 50.8 16 17 52.4 18 53.6 19 54.4 20 55.2

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Source: Canada Montgage and Housing Corporation: Saskatchewan Research Council (December 1992) Effectiveness of Clean-up Techniques for Leaded Paint Dust

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VPPENDIX E

SITE MAPS

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 3161 of 5269

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TABLE OF CONTENTS

1.	EXE	EXECUTIVE SUMMARY		
2.	LEA	D SAMPLING	2	
	2.1	Lead Wipe Sampling	2	
	2.2	Lead Air Sampling	2	
3.	PHYSICAL CONDITION OF FACILITY / PERSONNEL CONCERS			
	3.1	Lead Based Paint	3	
	3.2	Presumed Asbestos Containing Materials	4	
	3.3	Water Damage/Mold Growth	4	
	3.4	Housekeeping	4	
	3.5	Employee Interviews	4	
	3.6	Indoor Air Quality	4	
4.	LIGHTING SURVEY		6	
5.	CONCLUSION		7	