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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

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

B. Preliminary Visual Examination

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

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

C. Surface Painting or Sealing of Nonfloor Surfaces

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

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

D. Final Inspection

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

E. Recleaning After Clearance Failure

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

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

VI. Cleaning Cost Considerations

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

A. Initial Clearance Test Failure Rates

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

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

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

B. Key Factors In Effective Cleaning

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

C. Special Problems

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

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

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

VII. Alternative Methods

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

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

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

A. Vacuums

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

B. Trisodium Phosphate and Other Detergents

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

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

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

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

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

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

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

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

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

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APPENDIX F

RECOMMENDATIONS

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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 $\mu g/ft^2$ on floors and 250 $\mu g/ft^2$ 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.

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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.

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APPENDIX G

SITE MAPS

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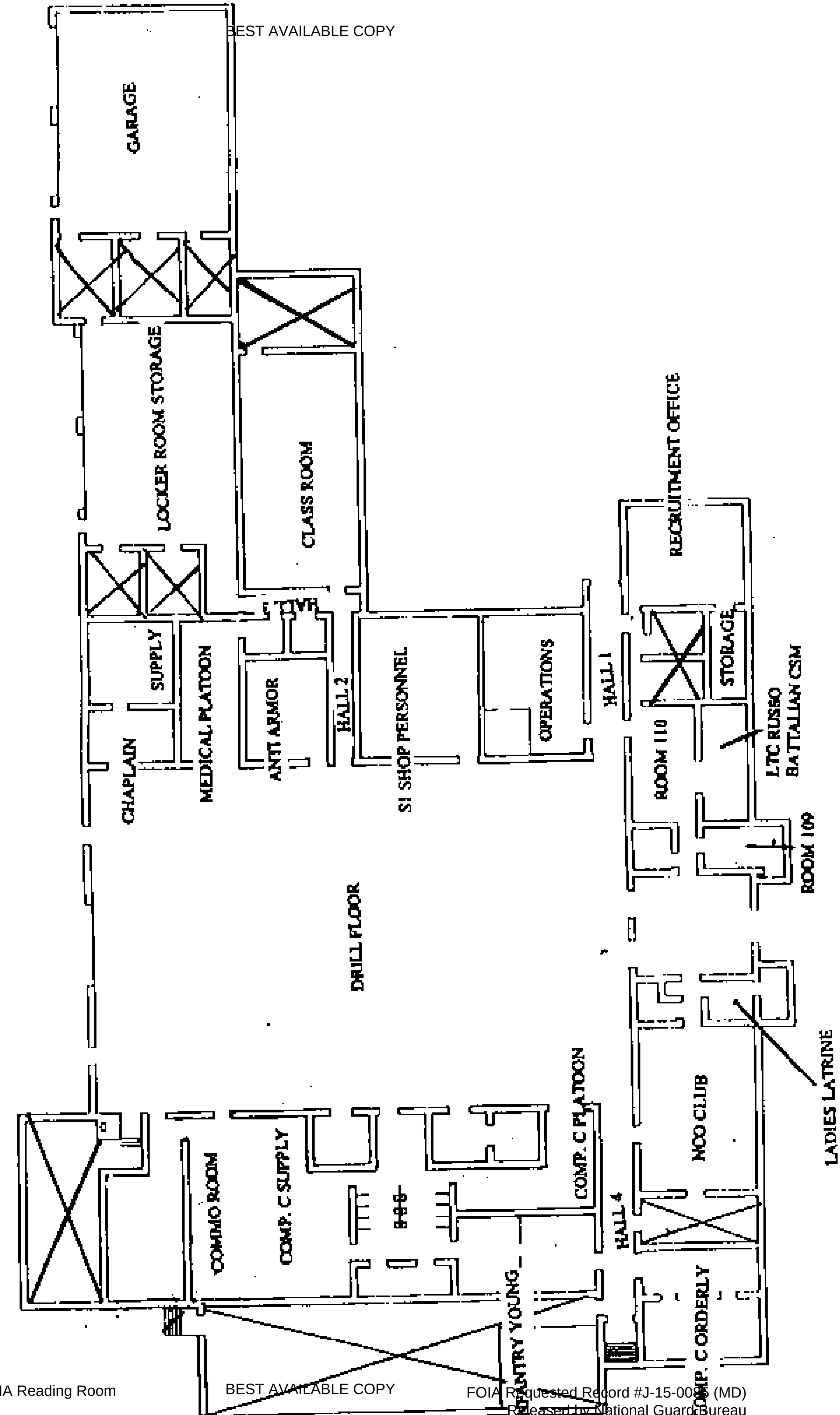

APPENDIX H

MOLD GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

TG 277

FEBRUARY 2002

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

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

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

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

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

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MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

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

REMEDIATION PLANNING

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

REMEDIATE MOISTURE AND MOLD PROBLEMS

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

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REMEDIATION PROCEDURES

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

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

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

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

FOUR REMEDIATION LEVELS

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

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

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

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

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

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

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

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

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

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

The following procedures *at a minimum* are recommended:

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

Refer to Appendix D for Containment procedures.

The work area and areas directly adjacent should be covered with a single layer of 6 mil fire-retardant polyethylene sheet(s) and taped before remediation, to contain dust/debris.

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

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

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

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

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

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

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

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

The following procedures are recommended:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The following procedures are recommended:

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

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

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

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

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

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

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

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

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

HAZARD COMMUNICATION

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

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CONCLUSION

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

REFERENCES

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

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

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

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

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

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

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

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

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APPENDIX A

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

Water Damage Cleanup and Mold Prevention

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

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

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

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

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

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

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APPENDIX B

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

Mold Remediation Guidelines

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

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

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

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

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

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

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

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APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

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Disposable Protective Clothing

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

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

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APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

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

Limited Containment

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

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

Full Containment

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

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

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

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

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

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

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

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

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

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

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

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

Assessments Requiring Sampling

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

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

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

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

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

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

References

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

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

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

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

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APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

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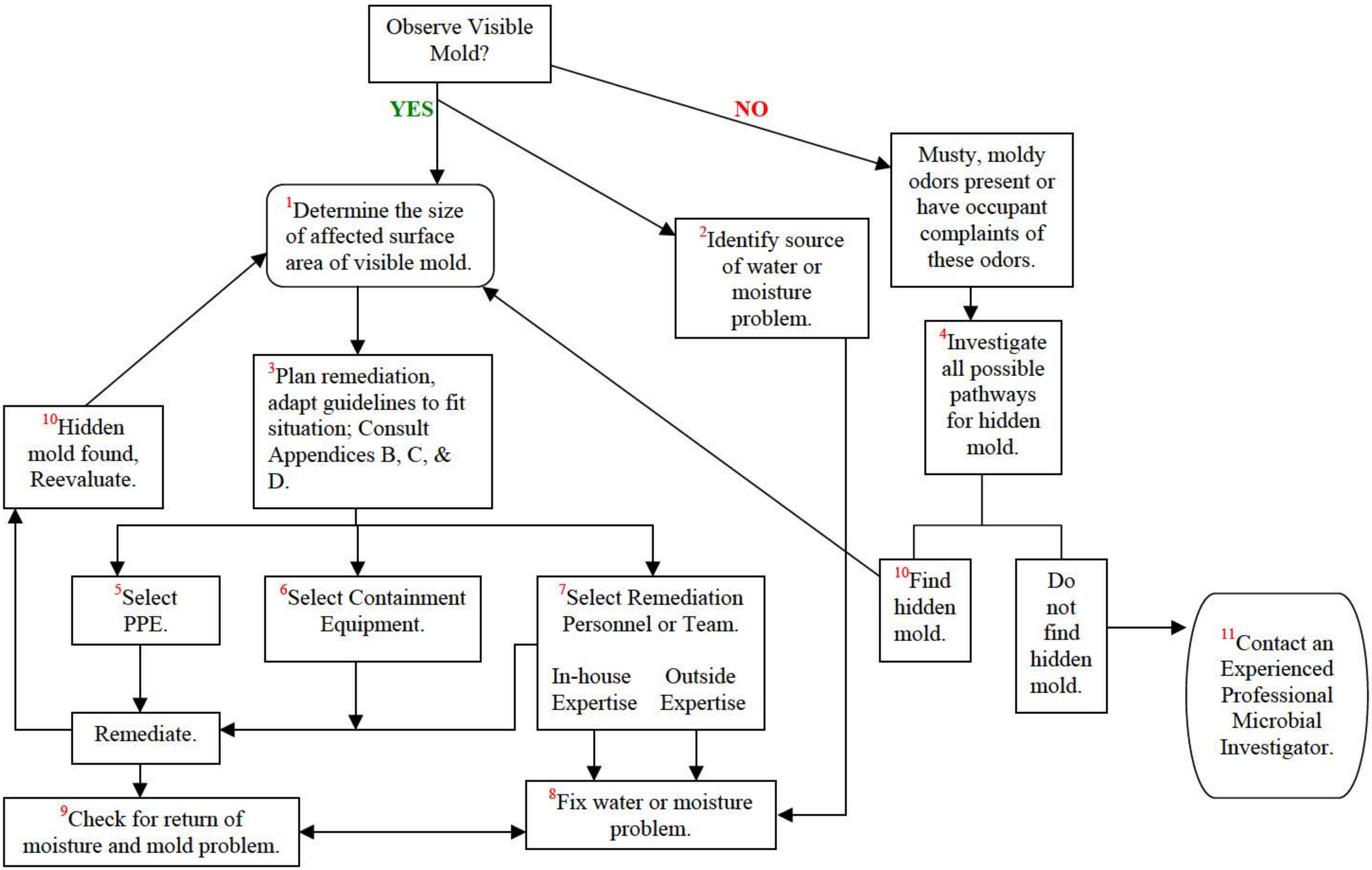
MOLD INVESTIGATION DECISION LOGIC



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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 activities[3]. Confirm negative pressure with smoke tubes.

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

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

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

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

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

APPENDIX B

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

Mold Remediation Guidelines

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

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

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

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

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

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

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APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

Disposable Protective Clothing

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

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

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

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

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

Full Containment

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

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USACHPPM

Readiness thru Health

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

Report Date: December 18, 2008

Project ID: IHMO080101.03

Non-Responsive [redacted] ________

Manager, Charlotte Operations

Non-Responsive [redacted]

Senior Industrial Hygienist

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EXECUTIVE SUMMARY

An industrial hygiene survey was conducted July 29, 2008 at the Readiness Center Facility Identification No. 492 located in Dundalk, Maryland. The study was performed by Mr. [redacted], CIH.

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

Lighting within the facility was also evaluated. Lighting was found to be within applicable recommended levels.

Various surfaces within the HVAC system and throughout the facility were screened for lead. The screening was completed using surface/wipe and air samples. None of the air samples collected were found to have detectable levels of the respective lead contaminant, and 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 Wipe™ samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 µm MCE cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, MD for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix B.

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Lead Testing Results Summary

Location	Air ug/m^3	Surface ug/ft^2	Bulk	Chip %Pb
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**

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/ft^2 as a benchmark for identifying contaminated surfaces. In the" Derivation of Wipe Surface Screening Levels for Environmental Chemicals", the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, HUD levels of 40 µg/ft^2 on floors and 250 µg/ft^2 on windowsills should be observed.

No detectable levels of lead were identified in those air samples collected. Currently, OSHA observed an 8-hour time weighted average of 50 ug/m^3.

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.

Lighting

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

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

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
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

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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.

IAQ Assessment Summary

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**

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.

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- 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,

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

References

Title 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration.

Lead - (29 CFR 1910.1025(h))

American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2008 Edition

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

Georgia Army National Guard: Standard Army Safety and Occupational Health Inspection Checklist; 1 October 1999 Edition

ANSI Z358.1 – 2004, Emergency Eye Wash and Shower Equipment

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

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

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

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

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

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

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

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Appendix A

Photographs

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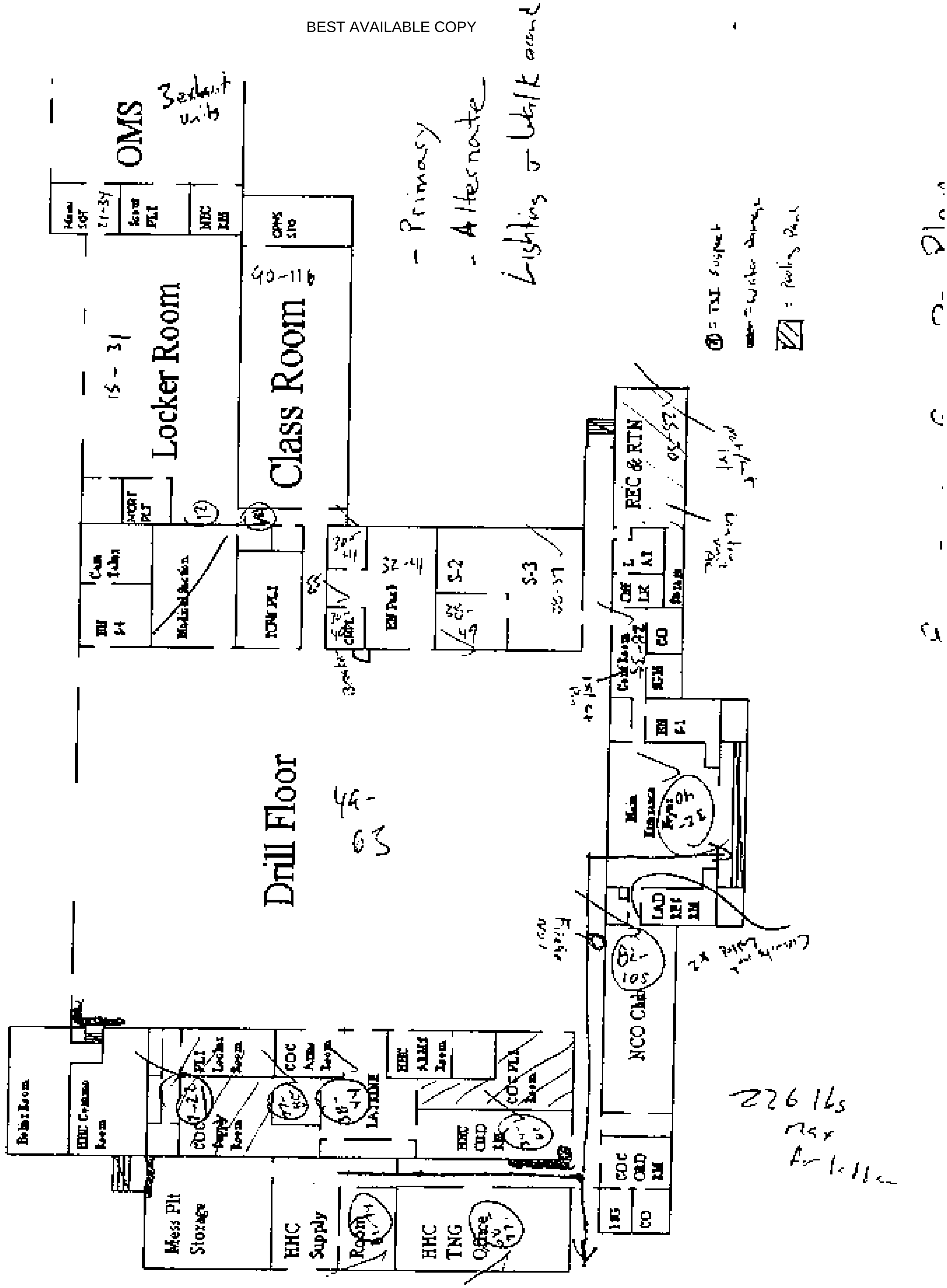
Exterior view of the facility

Delaminated paint located in COC Supply Room

View of delaminated paint weight room (drawing COC PL1)

View of two ceiling tile systems

View of TSI


OMS
OMS STO
Locker Room
Class Room
Drill Floor
REC & RTN
S-2
S-3
NCO Club
Main Entrance
LAD
Mess Plt Storage
HHC Supply Room
HHC TNG Office
Boiler Room
HHC Company Room
LATRINE
COC
CO
- Primary
- Alternate
226 lbs

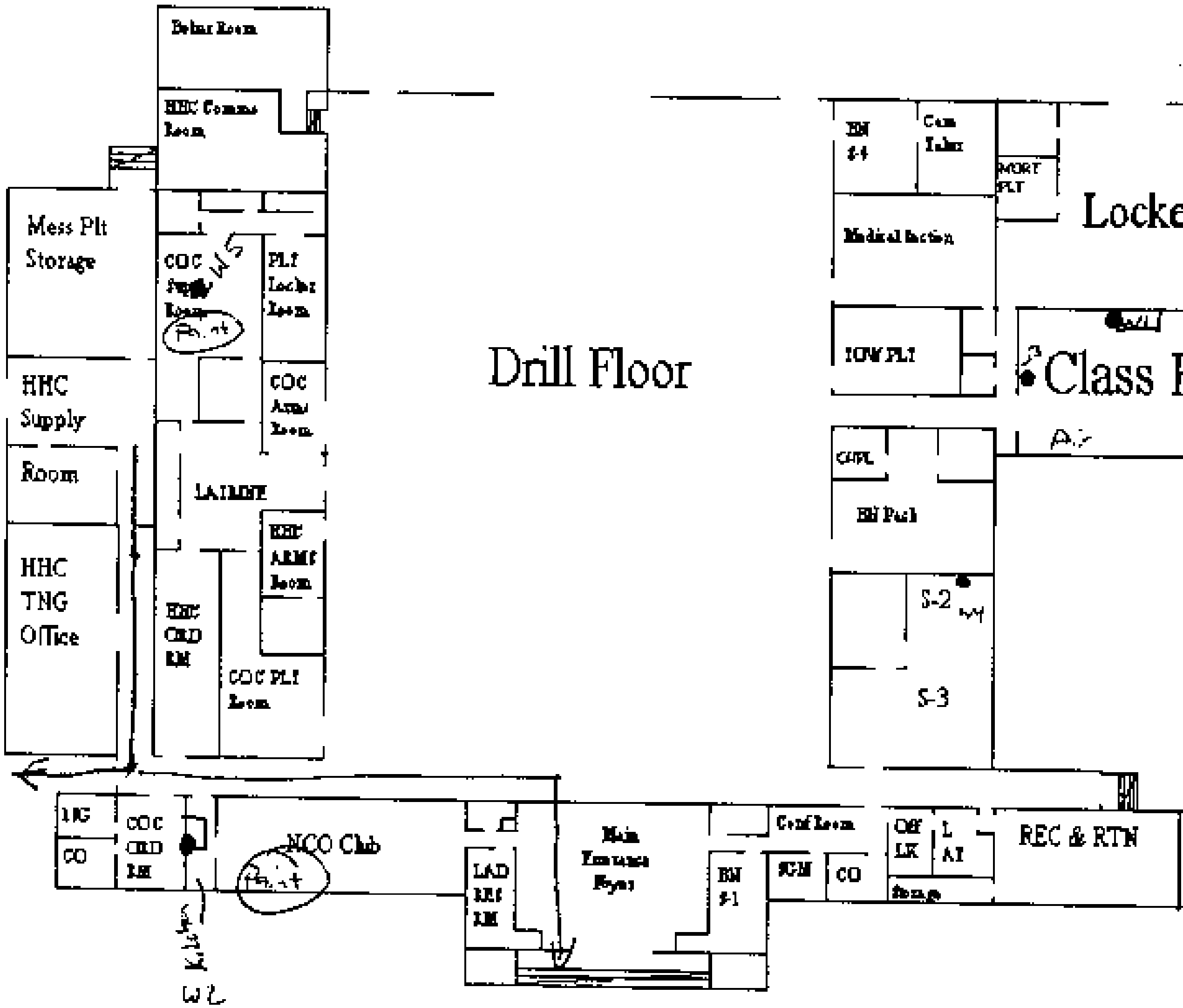
W1 - Well in old range 13 x 14.5

W2 - Kitchen . Fridge Top 10 x 13 Chips from ceiling present

W3 Old supply dept: Arms Range 24 x 3

W4 - Top of Locker Room S-3/S2 12 x 12.5

W5 - Supply . Top of shelf 13 x 13



- Primary

- Alternate

Sample Location

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Appendix B

Laboratory Analysis Report

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

100470
NY ELAP
10920

Client:	National Guard Bureau	**Job Name:**	RC 492 Dundalk, MD	**Chain Of Custody:**	181417
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	9/9/2008
Attention:	[redacted]			**Report Date:**	9/9/2008

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0882245	492-2	Flame	Air	972	N/A	3.09	ug/m³	<	3.1	ug/m³	
0882246	492-1	Flame	Air	952	N/A	3.15	ug/m³	<	3.2	ug/m³	
0882247	492-3	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	
0882248	W1	Flame	Wipe	****	1.309	9.17	ug/ft²	<	9.2	ug/ft²	
0882249	W2	Flame	Wipe	****	0.903	13.29	ug/ft²		1700	ug/ft²	
0882250	W3	Flame	Wipe	****	0.500	24.00	ug/ft²		15000	ug/ft²	
0882251	W4	Flame	Wipe	****	1.042	11.52	ug/ft²		49	ug/ft²	
0882252	W5	Flame	Wipe	****	1.174	10.22	ug/ft²		200	ug/ft²	
0882253	W6	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0882254	C1	Flame	Paint Chip	****	N/A	0.01	%Pb		0.17	%Pb	
0882255	C2	Flame	Paint Chip	****	N/A	0.01	%Pb		3.6	%Pb	

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

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA Accredited Laboratory — Environmental Lead — See aihaiap.org for details

100470

NY ELAP

10920

Client:	National Guard Bureau	**Job Name:**	RC 492 Dundalk, MD	**Chain Of Custody:**	181417				
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	9/4/2008				
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]				
		P.O. Number:	Not Provided	**Date Analyzed:**	9/9/2008	**Report Date:**	9/9/2008		
Attention:	[redacted]								

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

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

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

Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accrediation applies only to paint chip, wipe, and water 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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AMA Analytical Services, Inc.
Focused on Results
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 181417

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 701-1H Old Bay Lane
3. Address 2: Havre de Grace, MD 21078
4. Address 3:
5. Phone #: 336 455 2558 Fax #: 704 593 1640

Submittal Information:
1. Job Name: PC 492 Dundalk, MD
2. Job Location:
3. Job #: [redacted] P.O. #:
4. Contact Perso[redacted] @ phone # 336 455 2558
5. Submitted by: [redacted] Signature: [redacted]

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

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

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day + Date Due: 9/11/08
☐ 2 Day
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☐ Include COC/Field Data Sheets with Report
☒ Email: [redacted] @ ei2.com
☐ Fax:
☐ Verbals:

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

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

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

Lead Analysis
☒ Paint Chip 2 (QTY)
☒ Dust Wipe (wipe type ____) 6 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid ____ (QTY)
☐ TCLP ____ (QTY)
☐ Drinking Water ____ (QTY)
☐ Waste Water ____ (QTY)
☐ Dust Wipe Furnace (wipe type ____) ____ (QTY)

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

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
	See attached															

(ANALYSIS: TEM, PCM, PLM, LEAD, MOLD; MATRIX: AIR, BULK, DUST, WATER AND OTHER, SPORE TRAP, TAPE, SWAB)

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

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 9/4/08 @ 900 Via: UPS By (Print): M. Sampson Sign: [signature]
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ____ Sign:
3. Results Reported To: ____ Via: ____ Date: ___/___/___ Time: ____ Initials:
4. Comments:

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SAMPLE CHAIN OF CUSTODY

EI

DATE SHIPPED	# OF SAMPLES	SAMPLE MEDIA TYPE	PROJECT NAME
	11		Dunhill 18141?

CONTACT	TELEPHONE NUMBER
Non-Responsive [redacted]	336 455 2558

SAMPLE # OR AREA	SAMPLE DATE	SAMPLE VOLUME	ANALYSIS REQUESTED
492-2	7/25/08	971.81 L	Lead Air
492-1	↓	851.46 L	↓
492-3	↓	Ø L	↓
W1 Range fl	↓	188.5 in²	Lead wipe
W2 k.t. Fibe Tre	↓	130 in²	↓
W3 Range-old supply	↓	72 in²	↓
W4 Locker	↓	150 in²	↓
W5 Supply shelf	↓	164 in²	↓
W6 Blank	↓	0 in²	↓
C1	↓	—	Lead - chip
C2	↓	—	↓

Samples Relinquished By:	Non-Responsive [redacted]	8/15/08 Date
Samples Received By:	Signature	Date
Samples Analyzed By:	Signature	Date

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ANALYTICAL LABORATORY SERVICES, INC.

Environmental ✦ Industrial Hygiene ✦ Field Services

www.analyticallab.com

Industrial Hygiene Survey

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

Prepared For:	**National Guard Bureau Region North IH** **301-IH Old Bay Lane** **Havre de Grace, MD 21078**
Survey Location:	**Dundalk Armory** **2101 North Point Blvd.** **Dundalk, MD 21222**
Prepared By:	**Analytical Laboratory Services, Inc.** **3544 North Progress Avenue** **Suite 100** **Harrisburg, PA 17110**
Survey Date:	**August 5, 2010**
Report Date:	**August 30, 2010**
ALSI Project #:	**1008504**

Non-Responsive
[redacted]

Director, Environmental Health & Safety

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May, 2018
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Section 1.0
Executive Summary

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Section 1.0 Executive Summary

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

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/ft^2. Damaged paint should be repaired and properly remediated.

2. 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

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Section 2.0 Operation Description & Observations

The Dundalk 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 ceilings 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.

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Section 3.0
Noise Survey

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Section 3.0 Noise Survey

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

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Section 4.0
Lead Testing

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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 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.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2	Paint Chip %Pb
1	Drill Hall	<4		
2	S4 Office	<3.6		
3	Blank	<3 ug		
4	Supply Room - Chipping Paint from Ceiling			0.11
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	
11	Kitchen - Floor		<110	
12	Kitchen – Top of Locker		<110	
13	Communications Room - Top of Filing Cabinet		<110	
14	Supply Room – Top of Locker		160	
15	S3 Office - Top of Desk		<110	
16	Attached Garage - Table Top		<110	
17	Converted Firing Range – Floor		<110	
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	
21	S4 Office - Top of Glass Cabinet		<110	
22	Blank		<12 ug	
Criteria		50	200	0.5

Key: **Bolded** results exceed listed criteria

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

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

Deteriorated paint was observed in a few locations throughout the facility. Delaminated paint was mostly due to 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.

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Section 5.0
Lighting

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Section 5.0 Lighting

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

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Room 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	No
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

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.

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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 (CO_2) levels ranged from 426 ppm to 1,364 ppm within the facility compared to an outdoor CO_2 level of 428 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 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.

IAQ Assessment Summary

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 128th 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 128th 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 Range 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

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.

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Section 7.0
Suspect Asbestos Containing Building Materials

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Section 7.0 Suspect Asbestos Containing Building Materials

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

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

1. 9" x 9" 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.

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Section 8.0
Maintenance Bay

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Section 8.0 Maintenance Bay

There is a garage area at this facility. It is 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 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 9.0
Limitations

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Section 9.0 Limitations

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

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

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Appendix A
Laboratory Analysis Report

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP
10920

Client:	National Guard Bureau	**Job Name:**	Dundalk Armory	**Chain Of Custody:**	508544
Address:	301-JH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Dundalk, MD	**Date Submitted:**	8/11/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Dundalk Armory	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	8/13/2010 **Report Date:** 8/17/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

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AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
1069085	1008504-1	Flame	Air	745	N/A	4	ug/m^3	<3	<4	ug/m^3	
1069086	1008504-2	Flame	Air	839	N/A	3.6	ug/m^3	<3	<3.6	ug/m^3	
1069087	1008504-3	Flame	Air Blank	0	N/A	3	ug/m^3		<3	ug	
1069088	1008504-4	Flame	Paint Chip	****	N/A	0.01	%Pb		0.11	%Pb	
1069089	1008504-5	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1069090	1008504-6	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1069091	1008504-7	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1069092	1008504-8	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1069093	1008504-9	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1069094	1008504-10	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1069095	1008504-11	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1069096	1008504-12	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1069097	1008504-13	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1069098	1008504-14	Flame	Wipe	****	0.108	110	ug/ft^2	17	160	ug/ft^2	
1069099	1008504-15	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1069100	1008504-16	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1069101	1008504-17	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	
1069102	1008504-18	Flame	Wipe	****	0.108	110	ug/ft^2	41	380	ug/ft^2	
1069103	1008504-19	Flame	Wipe	****	0.108	110	ug/ft^2	<12	<110	ug/ft^2	

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

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP 10920

Client:	National Guard Bureau	Job Name:	Dundalk Armory	Chain Of Custody:	508544
Address:	301-JH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Dundalk, MD	Date Submitted:	8/11/2010
	Havre de Grace, Maryland 21078	Job Number:	Dundalk Armory	Person Submitting:	[redacted]
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	8/13/2010
				Report Date:	8/17/2010

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
1069104	1008504-20	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1069105	1008504-21	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1069106	1008504-22	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	

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

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

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

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

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

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

Air and Wipe results are not corrected for any blank results

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

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

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

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

Analyst: N. McGarvey / L. Butruk

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 NY ELAP, AIHA, NVLAP, NIST, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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OWI (410) 247-2024 159282 210 REV. 8.08

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **508544**

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

Submittal Information:
1. Job Name: Dundalk Armory
2. Job Location: Dundalk, MD
3. Job #: Dundalk [redacted] PO #: W912K6-09-A-0003
4. Contact Pers[redacted]
5. Submitted by [redacted]

Reporting Information (Results will be provided [redacted]

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day Date Due: 8/18/10 ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ In[redacted] With Report ☒ Em[redacted] analyticallab.com ☐ Fa[redacted] us.army.mil ☐ Ve[redacted] us.army.mil

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

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

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

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

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

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

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

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

Metals Analysis
- ☒ Pb Paint Chip 1 (QTY)
- ☒ Pb Dust Wipe (wipe type Ghost) 18 (QTY)
- ☒ Pb Air 3 (QTY)
- ☐ Pb Soil/Solid ____ (QTY)
- ☐ Pb TCLP ____ (QTY)
- ☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
- ☐ Pb Furnace (Media ____) ____ (QTY)

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

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER	SPORE TRAP	TAPE	SWAB
1008504-1	Drill Hall	8/5	746.2					X		X						
1008504-2	S4 Office		838.8					X		X						
1008504-3	Blank		0					X		X						
1008504-4	Supply Rm-Ceiling			$100cm^2$				X			X					
1008504-5	Rm 110-Bookshelf							X				X				
1008504-6	Lobby-Heater							X				X				
1008504-7	Drill Hall-Fl							X				X				
1008504-8	Drill Hall-Soda Machine							X				X				
1008504-9	Drill Hall-Table							X				X				
1008504-10	Lounge-Fireplace							X				X				
1008504-11	Kitchen-Fl							X				X				
1008504-12	Kitchen-Locker							X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)

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

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 8 / 11 / 10 @ 1030 Via: UPS By (Print): Nicole Maxwell Sign:
2. Date/Time Analyzed: ___ / ___ / ___ @ ___ By (Print): ___ Sign: ___
3. Results Reported To: ___ Via: ___ Date: ___ / ___ / ___ Time: ___ Initials: ___
4. Comments: ___

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Page 2 of 2

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

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

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

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

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

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

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ Email: [redacted] @us.army.mil
☐ Fax: @us.army.mil
☐ Verbal:

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

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

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

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

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

SAMPLE INFORMATION — ANALYSIS — MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER	SOIL	TAPE	SWAB
1008504-13	Comm. Rm-Filing Cabinet			100cm²				X				X				
1008504-14	Supply Rm. Locker							X				X				
1008504-15	Desk-S3 Office							X				X				
1008504-16	Garage-Table							X				X				
1008504-17	Firing Range-Fl							X				X				
1008504-18	Firing Range-Ledge							X				X				
1008504-19	Firing Range-Fan Vent							X				X				
1008504-20	Fl Outside Firing Range							X				X				
1008504-21	Office S4-Cabinet							X				X				
1008504-22	Blank			0cm²				X				X				

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

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

Appendix B. Photographs

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Appendix B
Photographs

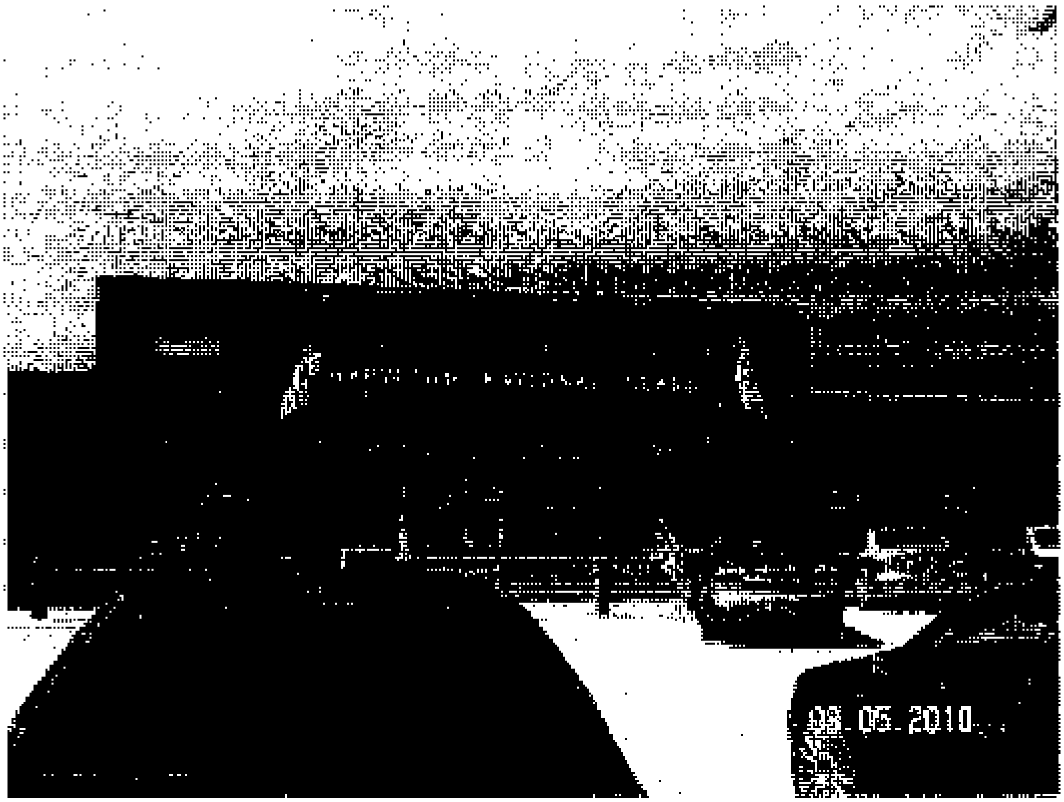

Photo 1: Exterior view, front.

Photo 2: Exterior view, front.

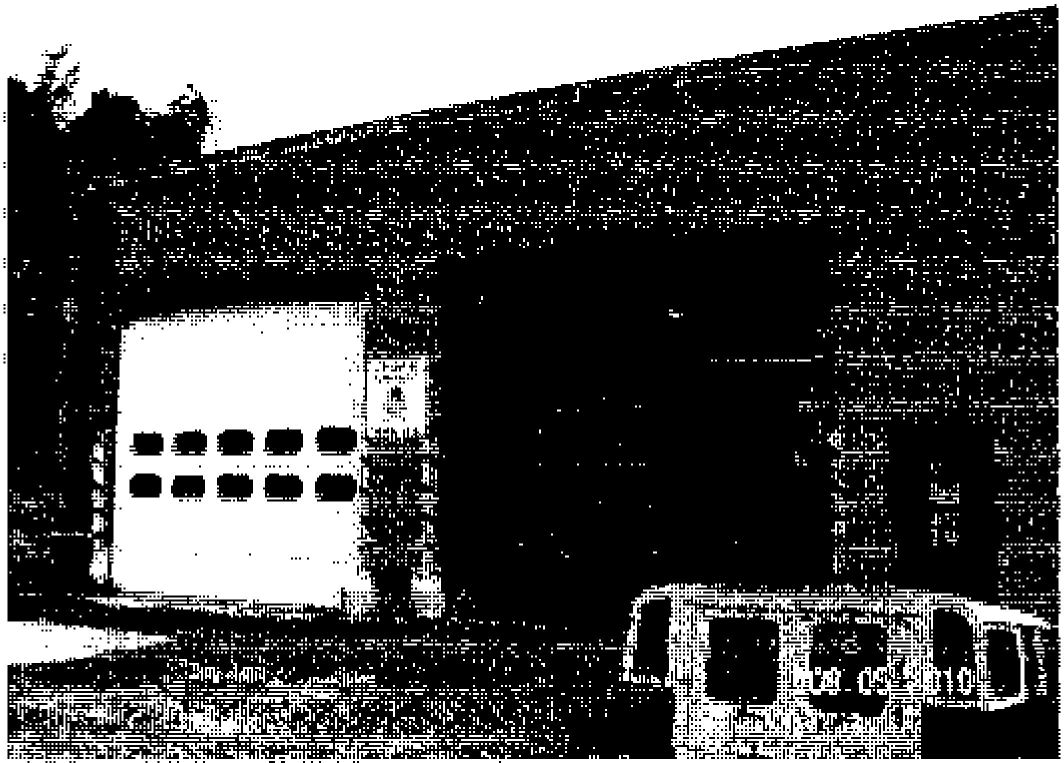

Photo 3: Exterior view, attached garage.

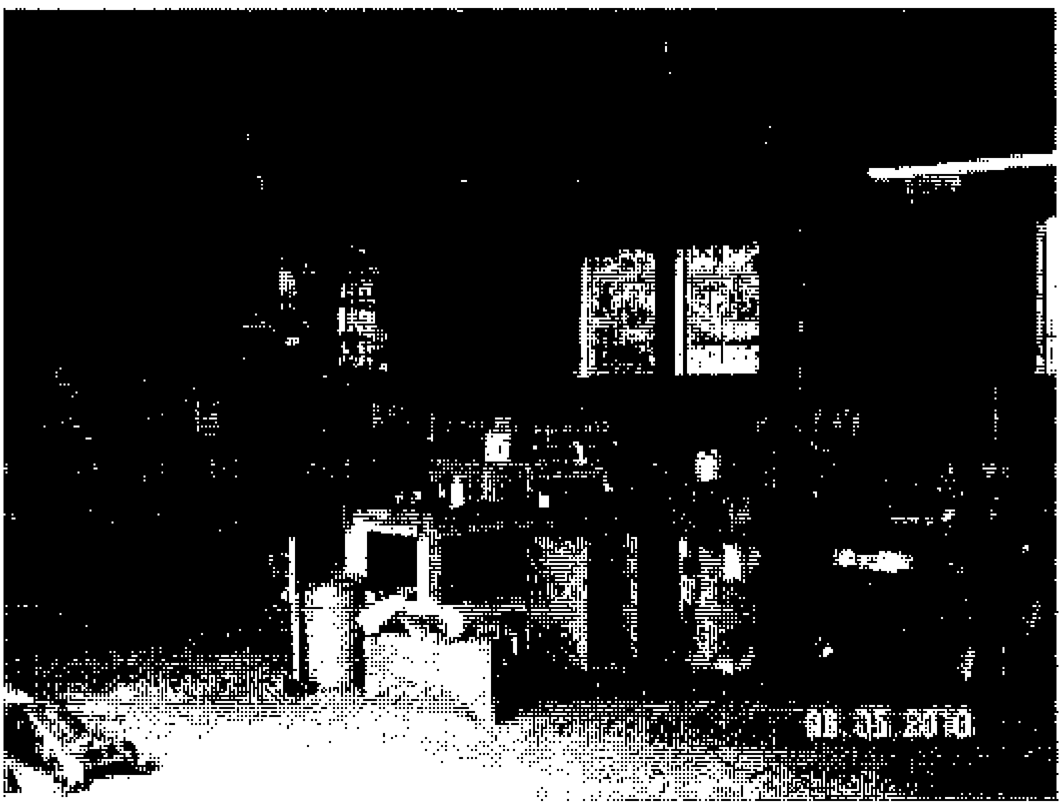

Photo 4: Interior view, attached garage.

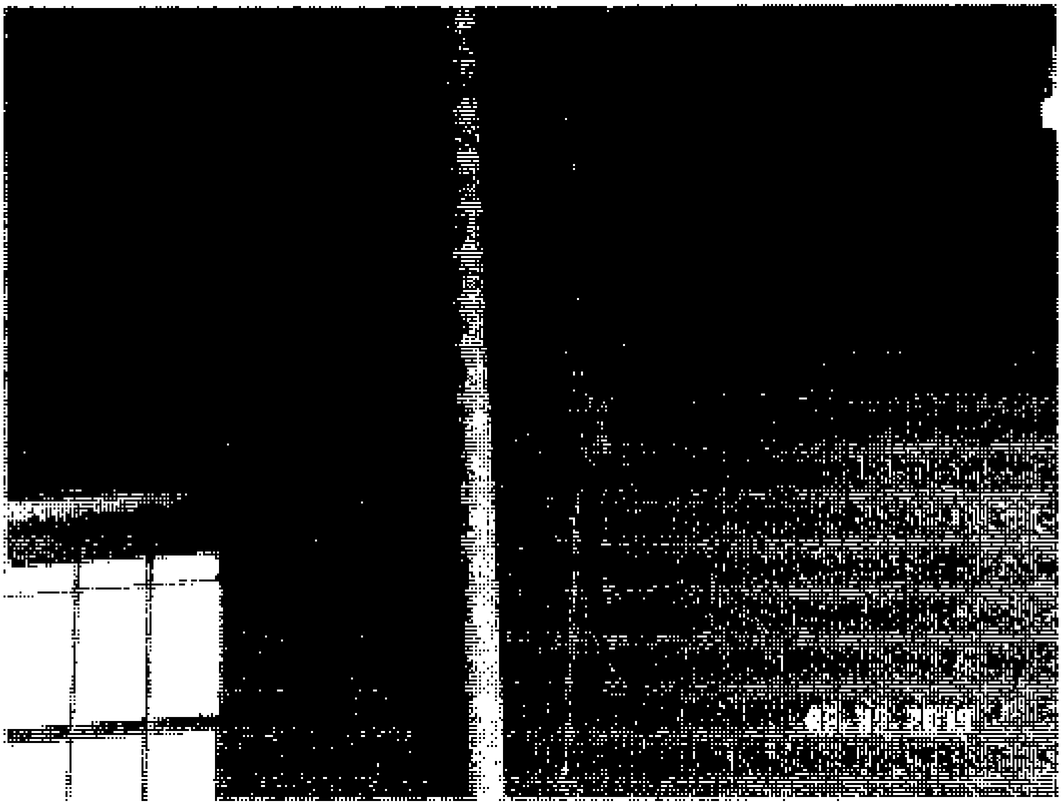

Photo 5: Exhaust hose in bay, attached garage; currently non-functional.

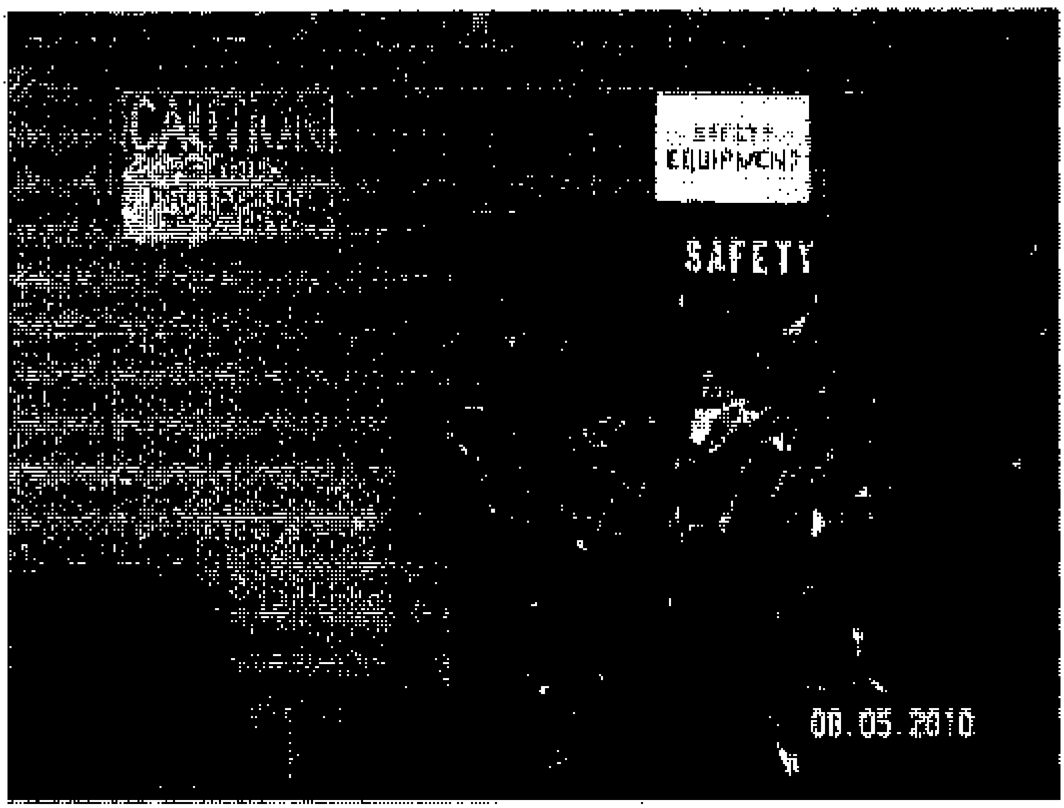

Photo 6: PPE in attached garage.

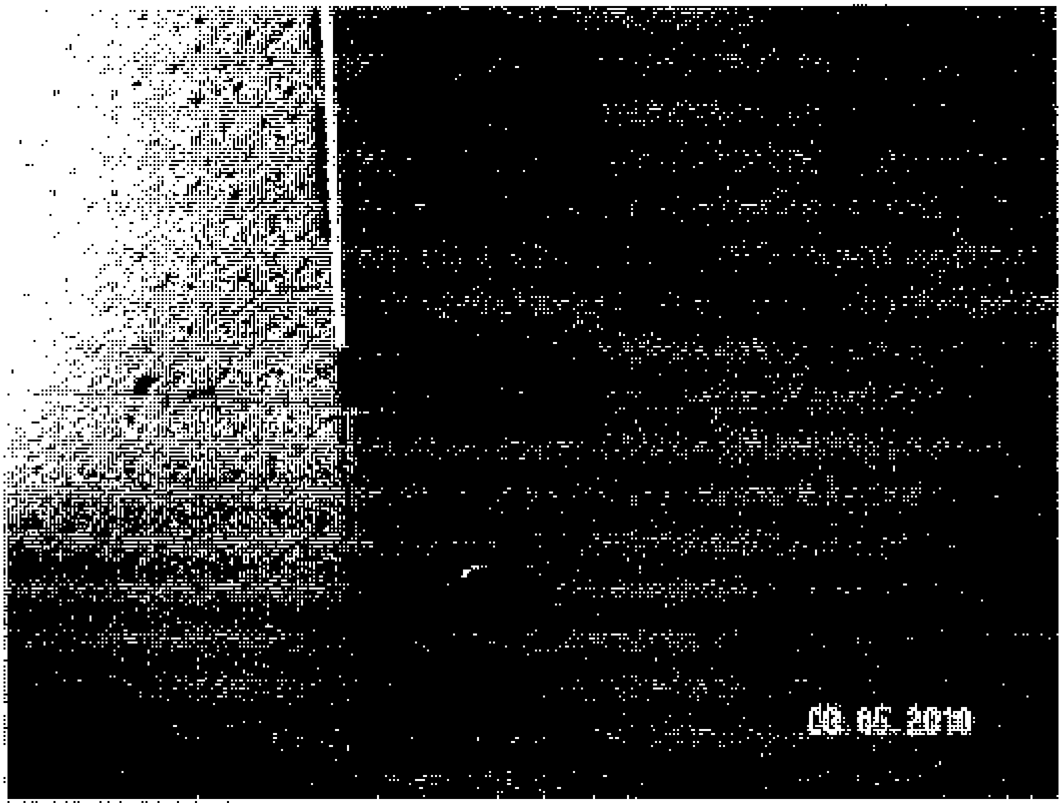

Photo 7: Room 110; damage to possible ACM ceiling tile.

Photo 8: Drill Hall.

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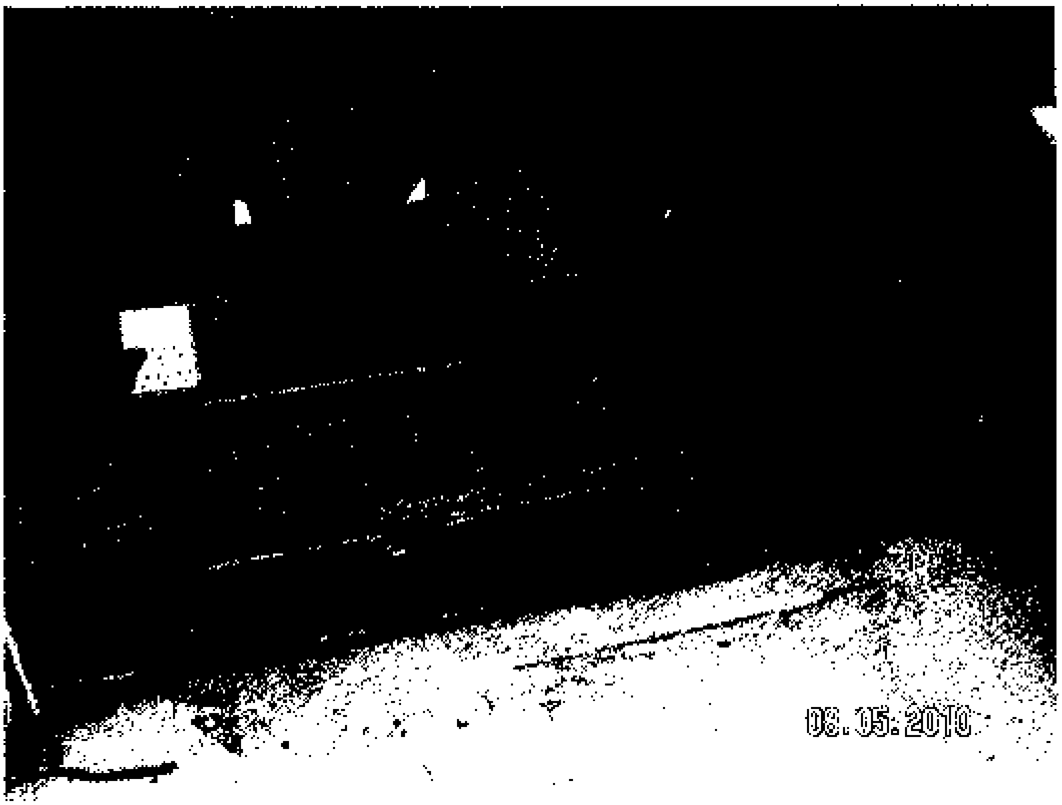


Photo 9: Heating vents.

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

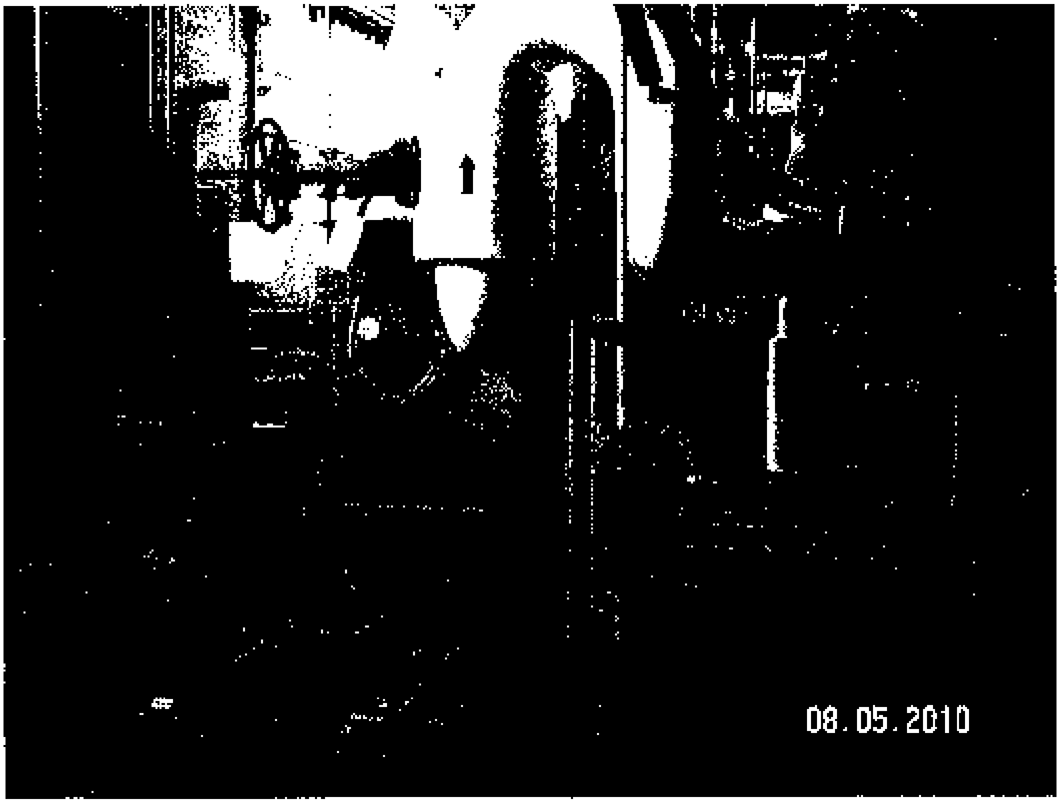


Photo 11: Boiler.

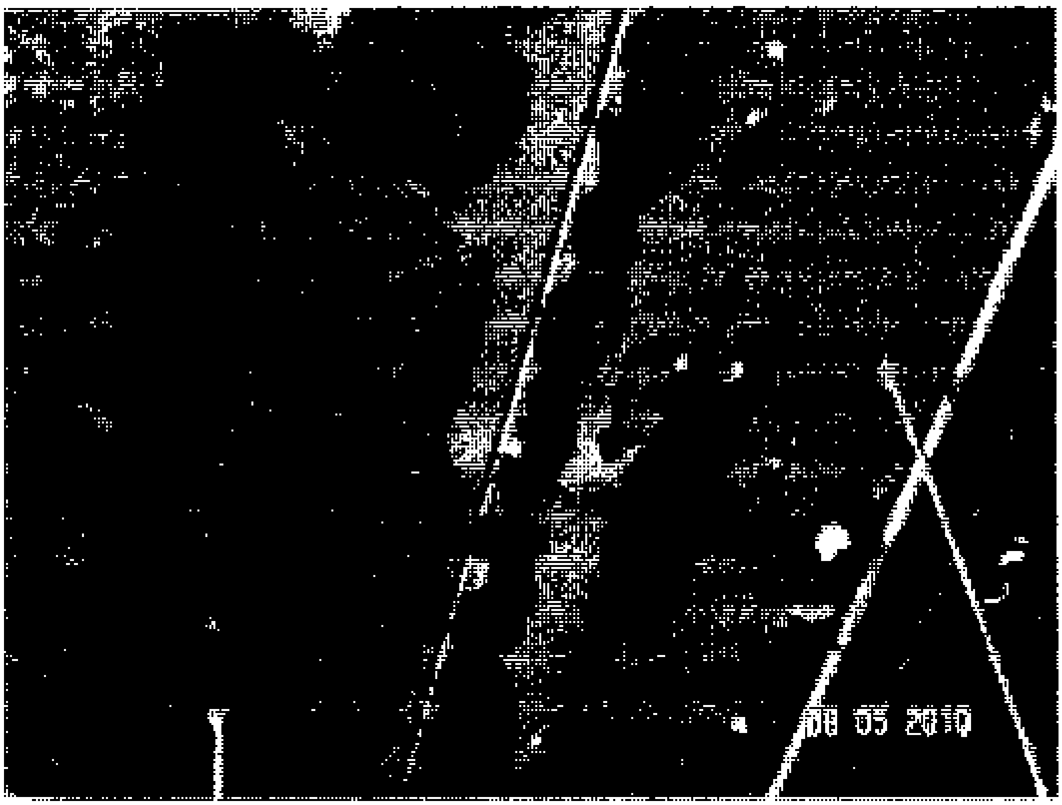


Photo 12: Boiler room. chipping paint on ceiling.

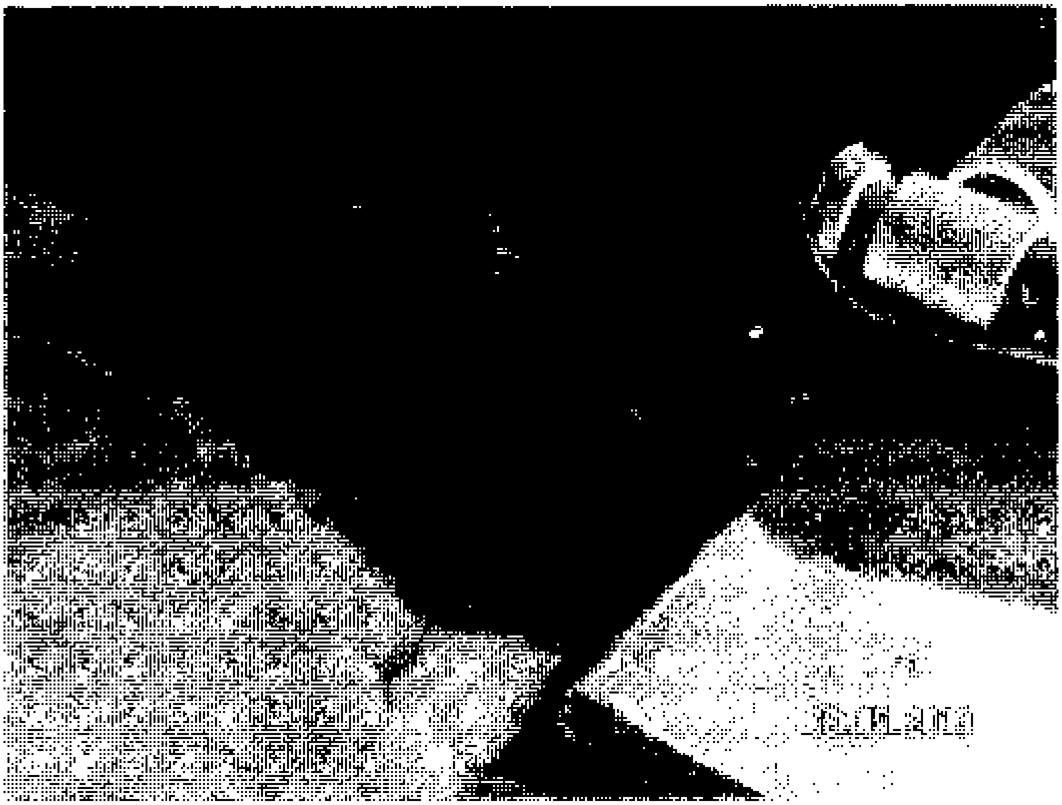


Photo 13: Standing water on floor dripping from pipe on boiler.

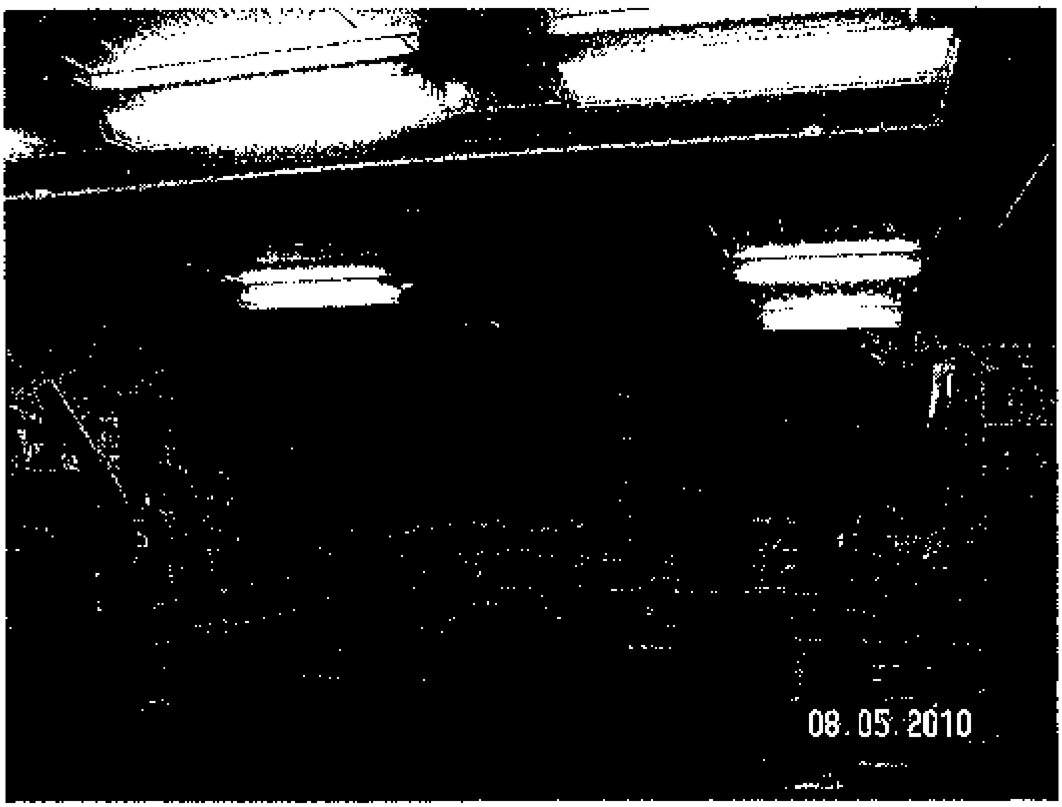


Photo 14: Converted firing range (gym).

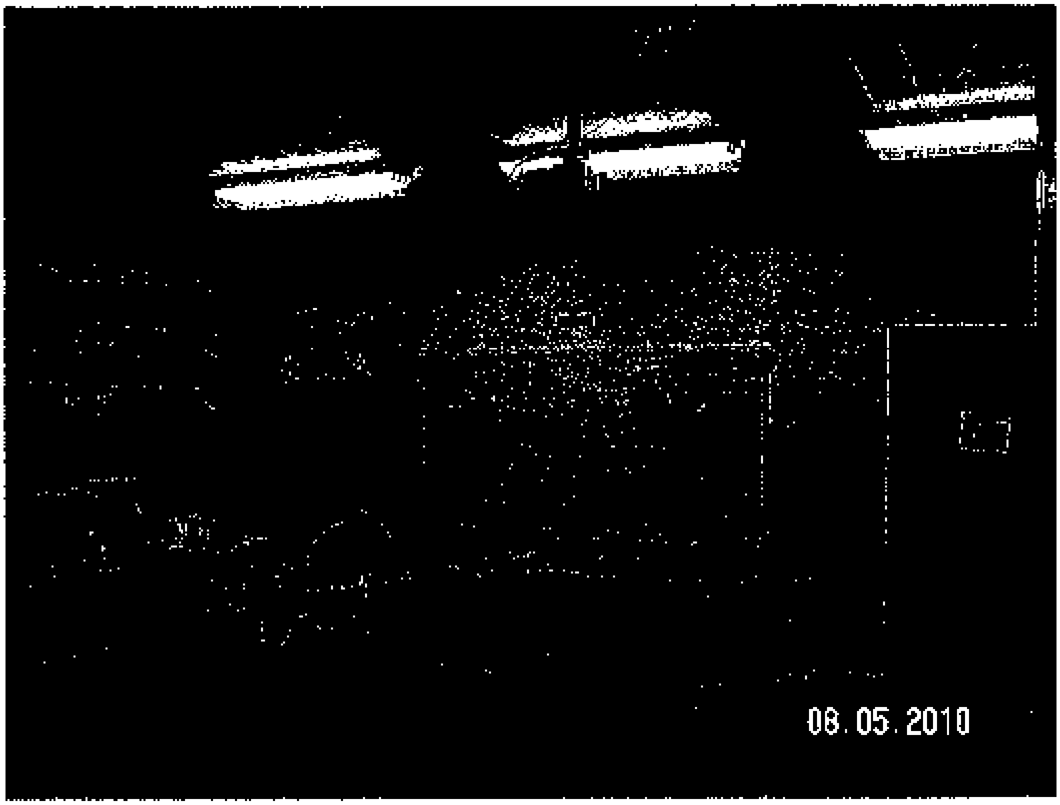
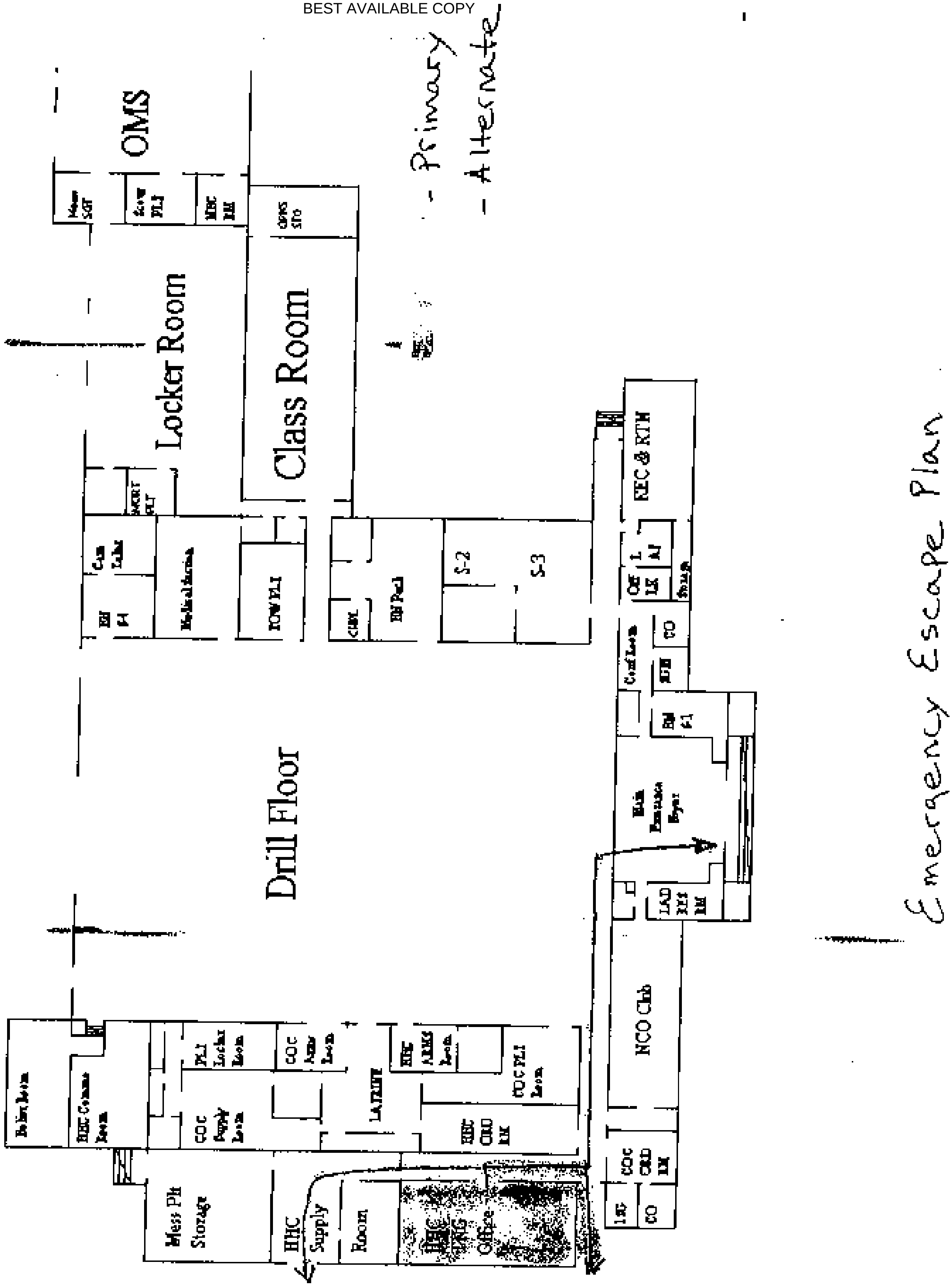


Photo 15: Converted firing range (office).

Appendix C
Floor Plans


Emergency Escape Plan
- Primary
- Alternate
OMS
Locker Room
Class Room
Drill Floor
S-2
S-3
HHC & RTM
NCO Club
Mess Plt Storage
HHC Supply Room
HHC UAS Office
LATRINE
CO
CO

Appendix D
References

Appendix D. References

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

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

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

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

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

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

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

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

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

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

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May, 2018

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

REPLY TO
ATTENTION OF

MCHB-TS-OFS May 2004

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

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03 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. [redacted] at [redacted]@apg.amedd.army.mil.

ENCL

[redacted]
Industrial Hygienist
Industrial Hygiene Field Services Program

Readiness thru Health
Printed on Recycled Paper

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

USACHPPM

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

Approved for public release; distribution unlimited.

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

Readiness Thru Health

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

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

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

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

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

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

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

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

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

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

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

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS, 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 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 to 15.0$\mu g/m^3$ as well as the Occupational Health and Safety Administration (OSHA) standard of 50$\mu g/m^3$ for lead in air. Three dust-lead wipe sample results, located on the floor of the former IFR, exceeded the USACHPPM recommended decontamination level of 200$\mu g/ft^2$ for dust-lead on frequently contacted surfaces (200 to 1100$\mu g/ft^2$) (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

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 40μg/ft^2 on floors and 250μg/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

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

REPLY TO
ATTENTION OF

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

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

LOCATION: BG Louis G Smith Armory, Easton MD

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

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

3. BACKGROUND INFORMATION.

a. Armory Mission. Light Infantry. Changing to Anti Armor Unit.

b. Date of Construction. 1975.

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

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

(3) Mold. No mold was observed.

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

c. Training. SSG [redacted] 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 [redacted], 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

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 15.0µg/m³ as well as the Occupational Health and Safety Administration (OSHA) standard of 50µg/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 200µg/ft² for dust-lead on frequently contacted surfaces (200 to 1100µg/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 to 15.0µg/m³ as well as the Occupational Health and Safety Administration (OSHA) standard of 50µg/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 200µg/ft² for dust-lead on frequently contacted surfaces. The results were 200 to 1100µg/ft² (photos 1593, 1594, and 1595). Paint sampling was conducted for deteriorated paint. One sample was from

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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 40µg/ft² 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 [redacted]@apg.amedd.army.mil.

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

ENCLOSURE

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 40μg/ft² on floors and 250μg/ft² for dust-lead on window sills.

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APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

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Subject: Proposed Recommendations for Surface Lead in Armories

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

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

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

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

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

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

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

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

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Project No. 55-ML-01ED-03

APPENDIX B

SITE MAPS

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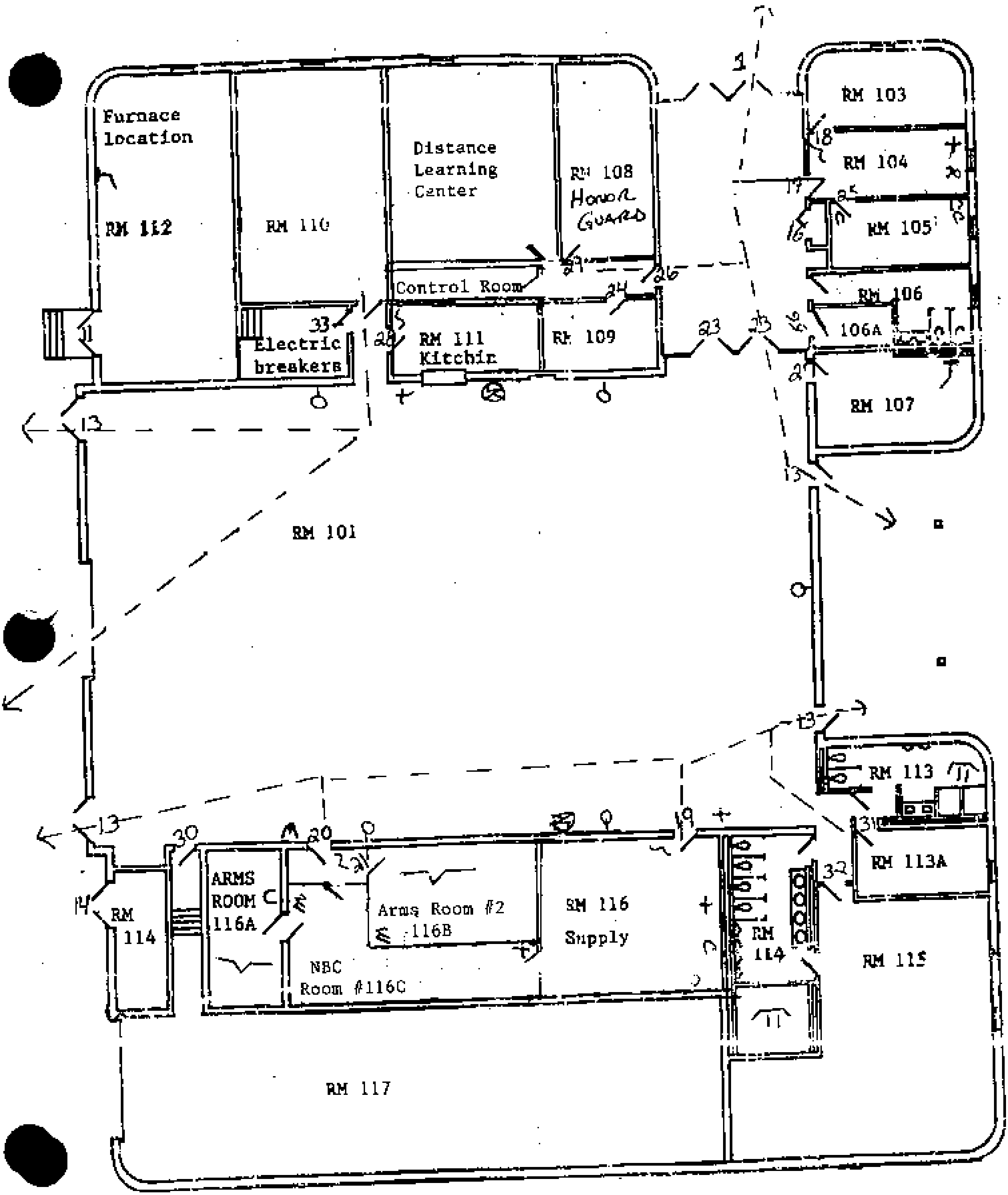

EASTON ARMORY
FLOOR PLAN

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Project No. 55-ML-01ED-03

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
1600	Desk in Room 105 near window
1601	Wall in Room 103 Recruiter Office
1602	Room 107 Library/ peeling paint

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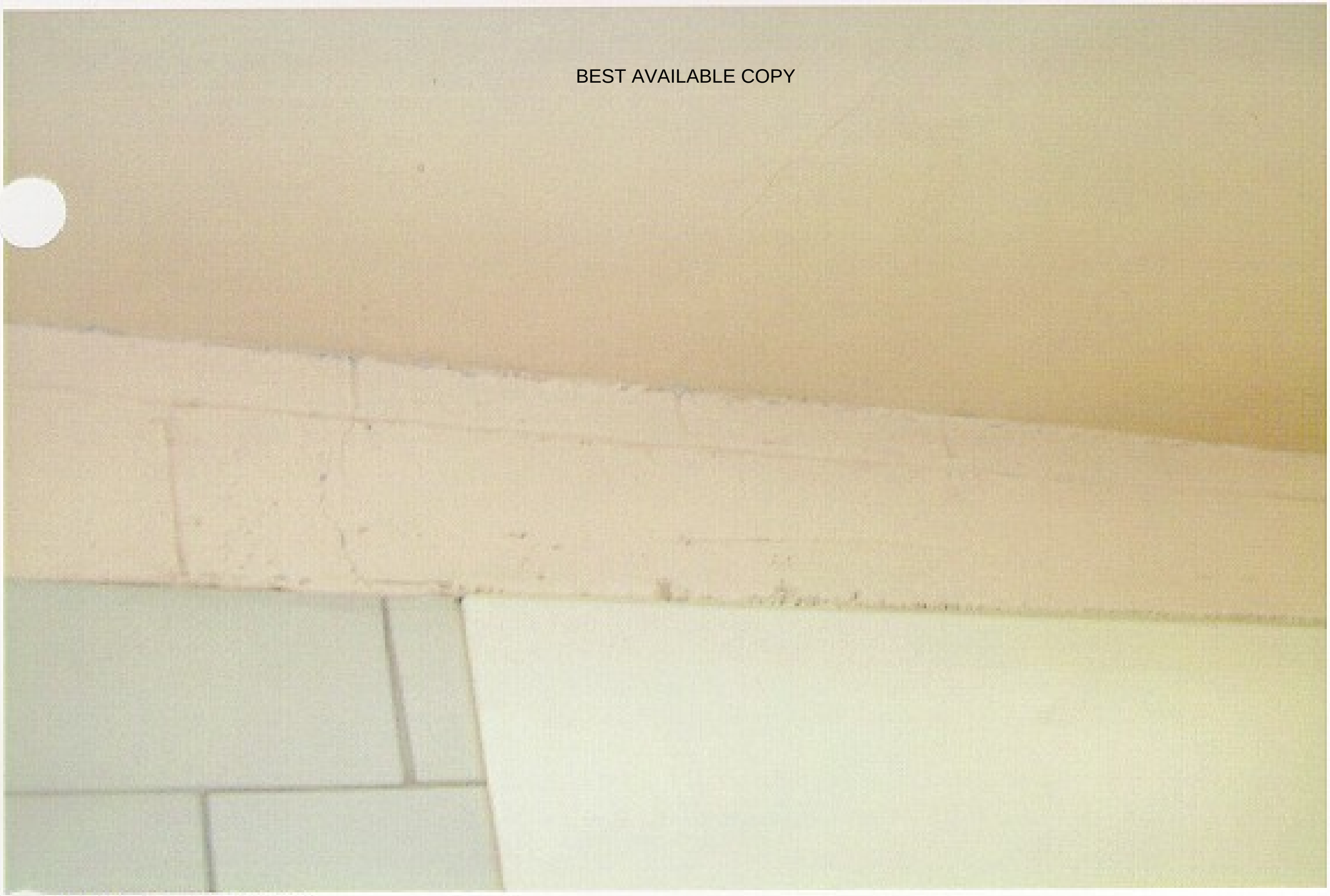

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APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

Wipe Sample #	Armory	City	Indoor Range Info				Location of Samples	Conc. (µg/ft²)
			Active	Inactive	N/A	Cleaned?		
				Yes		Unknown		
EAW01	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	<110
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	<110

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

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CERTIFICATE OF ANALYSIS

[redacted]NVLAP
NY ELAP
AIHA

Client:	National Guard Bureau	**Job Name:**	Not Provided	**Chain Of Custody:**	117281
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Analyzed:**	09/09/2003
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	Non-Responsive
		P.O. Number:	Not Provided	**Report Date:**	09-Sep-03

Attention: Non-Responsive

Summary of Atomic Absorption Analysis for Lead

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

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.

JWilloughby
Analyst: Jodi Willoughby

G Edward Carney
Technical Manager: G Edward Carney

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CERTIFICATE OF ANALYSIS

NVLAP
NY ELAP
AIHA

Client:	National Guard Bureau	**Job Name:**	Not Provided	**Chain Of Custody:**	117281
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Analyzed:**	09/09/2003
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		P.O. Number:	Not Provided	**Report Date:**	09-Sep-03

Attention: [redacted] Non-Responsive

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AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0366797	EA W01	Flame	Wipe	****	0.108	111.52	ug/ft²		200	ug/ft²	
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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	

BULK SAMPLES

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

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

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

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

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

Analyst: JWilloughby Jodi Willoughby   **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. All rights reserved. AMA Analytical Services, Inc.

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APPENDIX E

REFERENCES

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APPENDIX E

REGULATIONS AND STANDARDS

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

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

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

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

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

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

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

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

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

APPENDIX F

LEAD CLEANING GUIDANCE

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CHAPTER 14: CLEANING

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.

2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.

3. Have sufficient cleaning equipment and supplies *before* beginning work.

4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.

5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.

6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.

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

8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.

9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.

10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.

11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.

12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.

13. Paint or otherwise seal treated surfaces and interior floors.

14. Conduct a clearance examination (see Chapter 15).

15. If clearance is not achieved, repeat the final cleaning.

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Step-by-Step Summary (continued)

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

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Chapter 14: Cleaning

I. Introduction

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

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

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

A. Performance Standard

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

B. Small Dust Particles

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

C. Difficulties in Cleaning

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

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

1. Low Clearance Standards

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

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

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

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

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2. Worker Inexperience

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

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

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

4. Deadlines

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

II. Coordination of Cleaning Activities

A. Checklist

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

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

B. Equipment Needed for Cleaning

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

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C. Waste Disposal

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

III. Cleaning Methods and Procedures

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

A. Containment

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

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

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

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

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

1. HEPA Vacuuming

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

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

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Operating Instructions

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

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

Special Attachments

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

Selecting Appropriate Size(s)

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

Wet-Dry HEPA Vacuums

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

Prefilters

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

HEPA Vacuuming Procedures

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

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

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

Emptying the HEPA Vacuum

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

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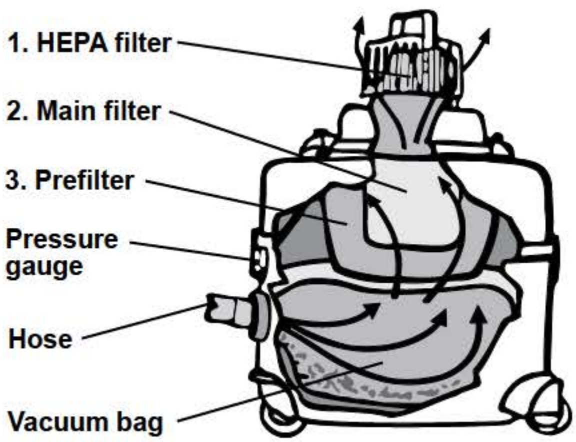
Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

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

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

2. Wet Detergent Wash

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

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

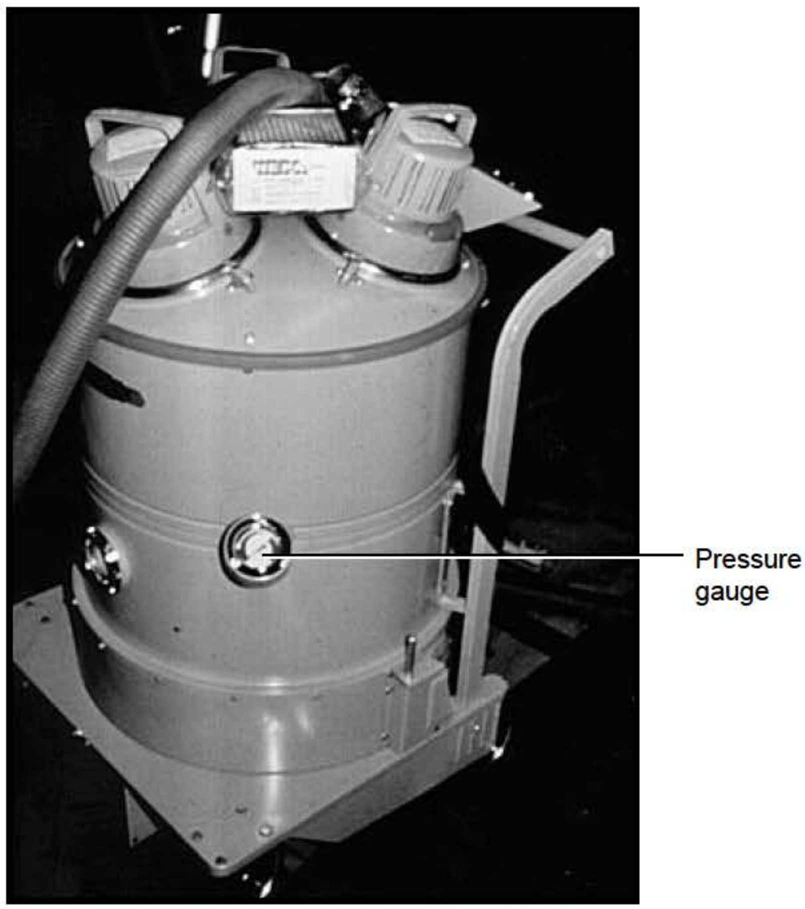


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

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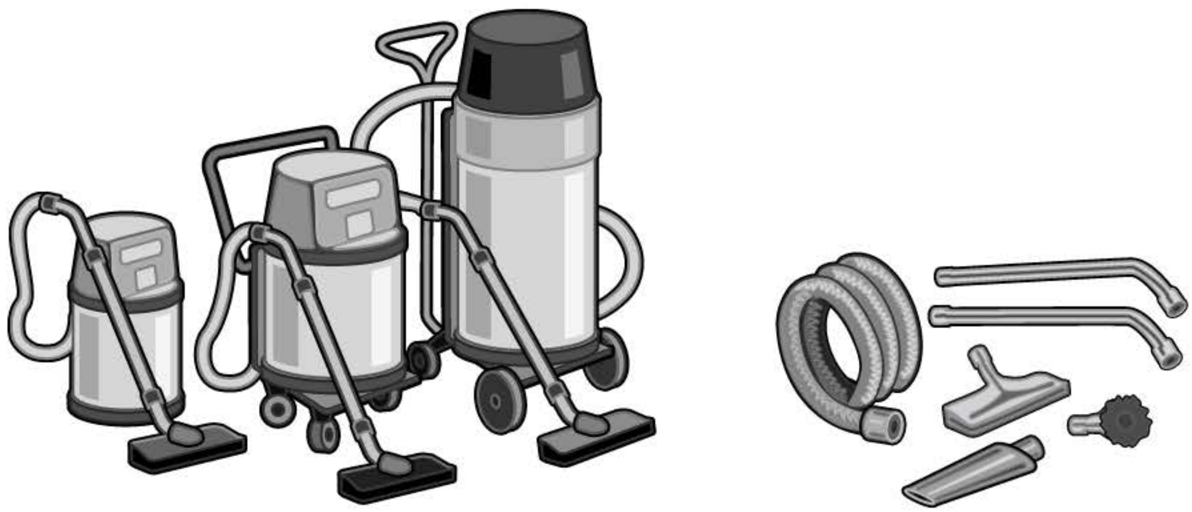
Figure 14.2 HEPA Vacuum Sizes and Tools.



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

Manufacturer's Dilution Instructions

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

Appropriate Cleaning Equipment

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

Proper Wet-Cleaning Procedures

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

Changing Cleaning Mixture

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

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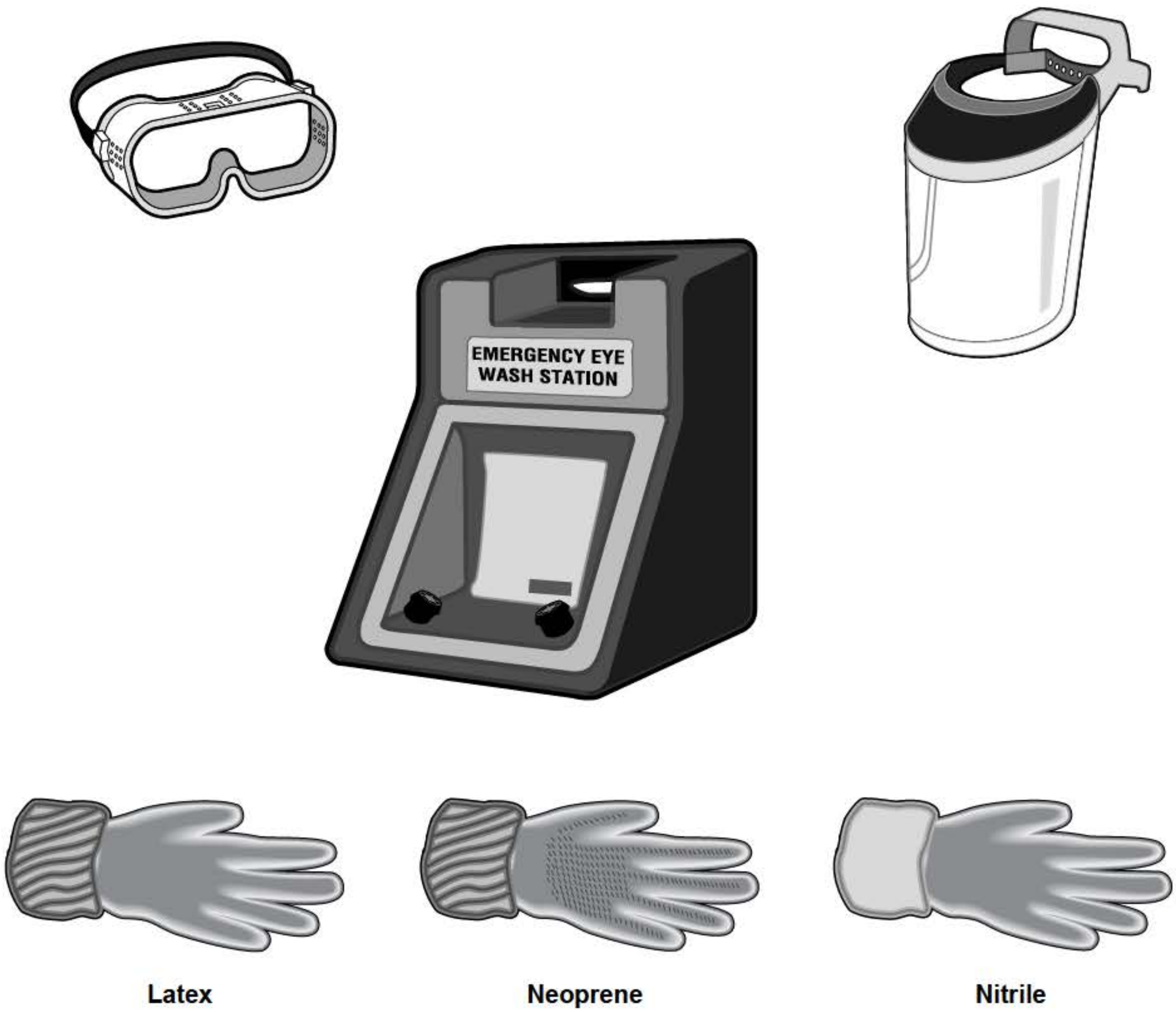
Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



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

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

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

- First, the area is HEPA vacuumed.

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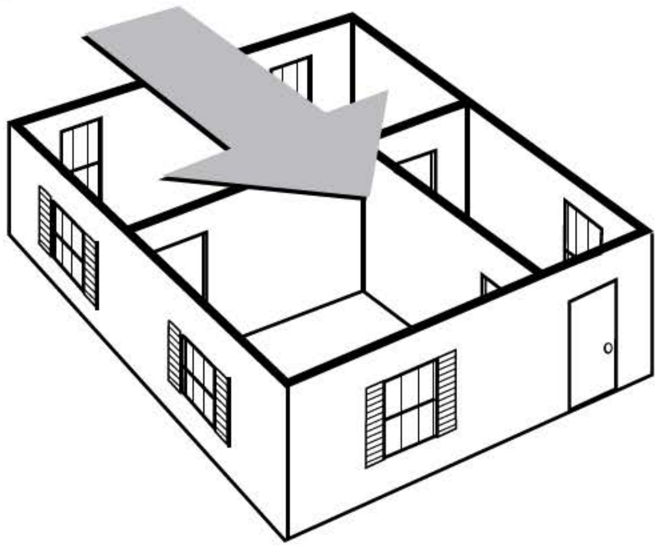
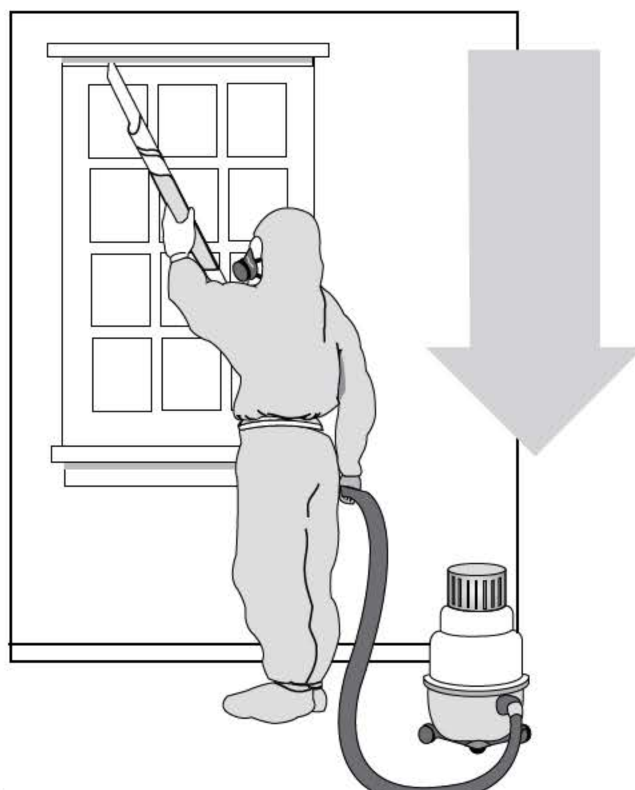
Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

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



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



Courtesy: Alice Hamilton Occupational Health Center

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

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

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

Single-Pass Wet Wash/HEPA Vacuum

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

Figure 14.4b (continued)

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

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

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

Rubber Cone

Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

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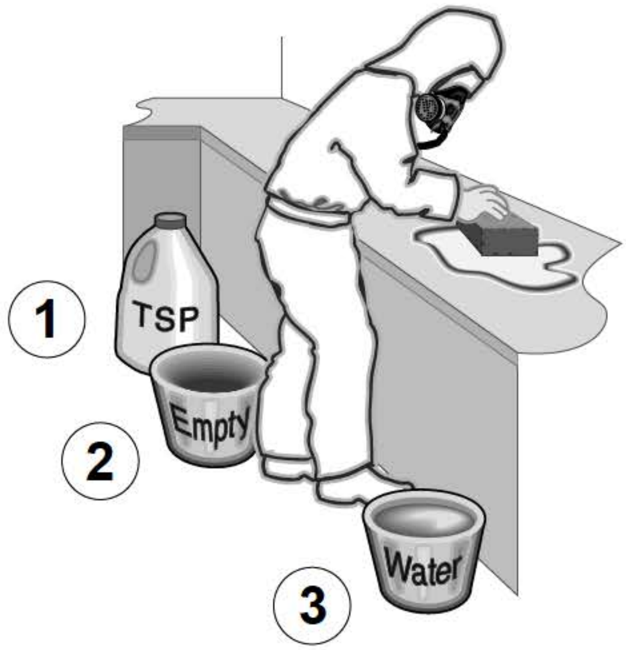
Figure 14.4c (continued)

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



Wipe All Surfaces

Wet Mop Floor

Don't Dry Sweep

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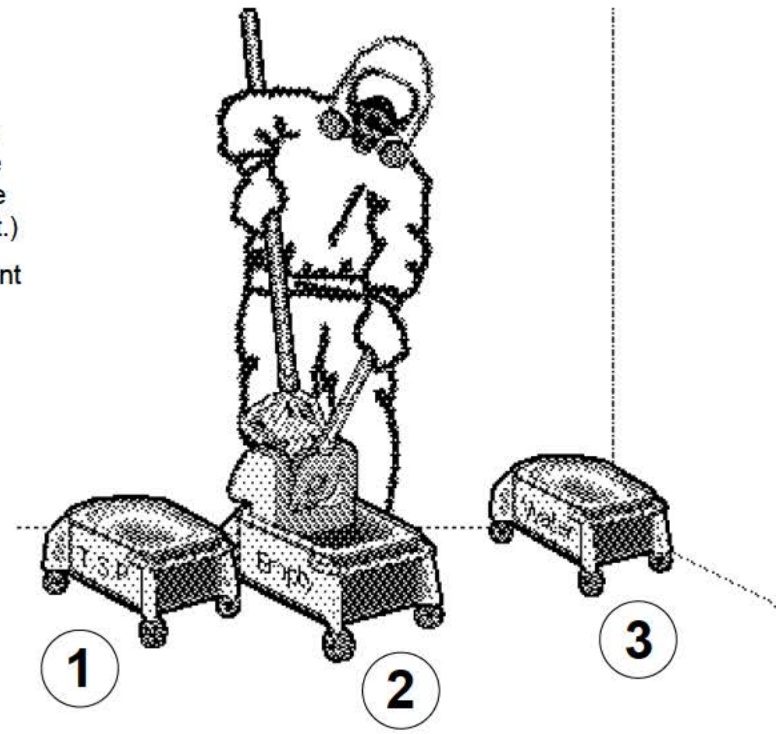
Figure 14.4c (continued)

Use the 3-Bucket System.

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

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



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

Use the third bucket for rinsing the floor.

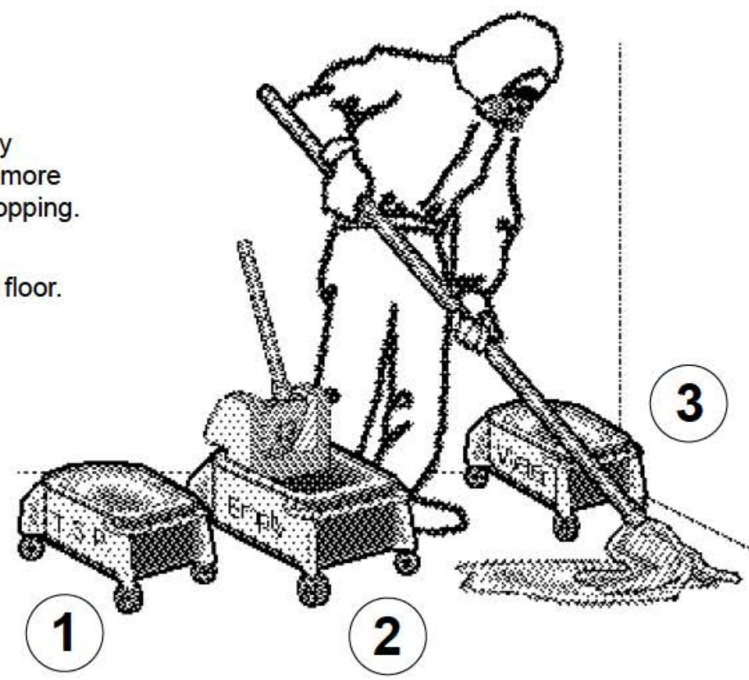


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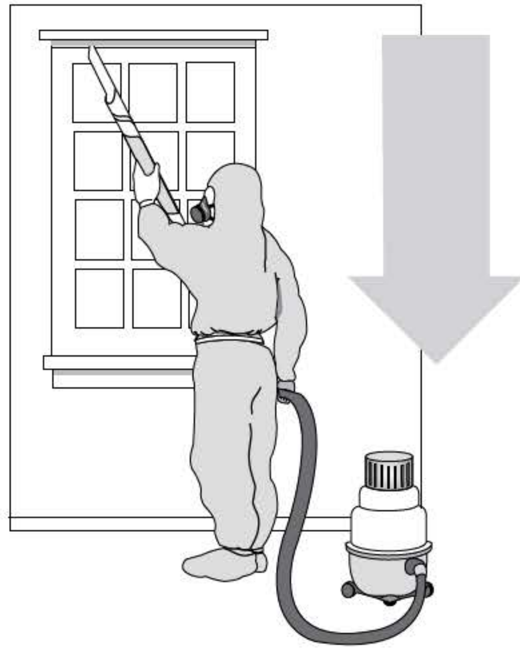
Figure 14.4d (continued)

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

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



4. Sealing Floors

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

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

IV. Order of Cleaning Procedures During Lead Hazard Control

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

A. Precleaning Procedures

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

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

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

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

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

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

B. Ongoing Cleaning During the Job

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

C. Daily Cleaning Procedures

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

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

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

1. Large Debris

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

2. Small Debris

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

3. Exterior Cleaning

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

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

4. Worker Protection Measures

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

5. Maintaining Containment

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

V. Order of Final Cleaning Procedures After Lead Hazard Control

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

A. Final Cleaning

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

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

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

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

1. Decontamination of Workers, Supplies, and Equipment

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

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

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

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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

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

B. Preliminary Visual Examination

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

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

C. Surface Painting or Sealing of Nonfloor Surfaces

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

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

D. Final Inspection

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

E. Recleaning After Clearance Failure

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

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

VI. Cleaning Cost Considerations

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

A. Initial Clearance Test Failure Rates

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

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

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

B. Key Factors In Effective Cleaning

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

C. Special Problems

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

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

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

VII. Alternative Methods

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

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

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

A. Vacuums

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

B. Trisodium Phosphate and Other Detergents

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

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

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

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

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

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

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

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

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

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APPENDIX G

MOLD GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

TG 277

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Readiness thru Health

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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

ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

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

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

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

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

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MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

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

REMEDIATION PLANNING

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

REMEDIATE MOISTURE AND MOLD PROBLEMS

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

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REMEDIATION PROCEDURES

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

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

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

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

FOUR REMEDIATION LEVELS

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

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

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

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

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

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

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

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

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

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

The following procedures *at a minimum* are recommended:

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

Refer to Appendix D for Containment procedures.

The work area and areas directly adjacent should be covered with a single layer of 6 mil fire-retardant polyethylene sheet(s) and taped before remediation, to contain dust/debris.

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

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

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

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

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

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

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

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

The following procedures are recommended:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The following procedures are recommended:

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

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

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

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

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

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

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

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

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

HAZARD COMMUNICATION

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

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CONCLUSION

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

REFERENCES

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

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

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

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

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

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APPENDIX A

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

Water Damage Cleanup and Mold Prevention

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

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

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

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

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

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

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APPENDIX B

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

Mold Remediation Guidelines

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

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

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

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

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

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

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

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Disposable Protective Clothing

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

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

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APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

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

Limited Containment

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

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

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

Full Containment

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

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TG 277

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

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

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

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

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

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

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

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

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

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

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

Assessments Requiring Sampling

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

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

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

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

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

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

References

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

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

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

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

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APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

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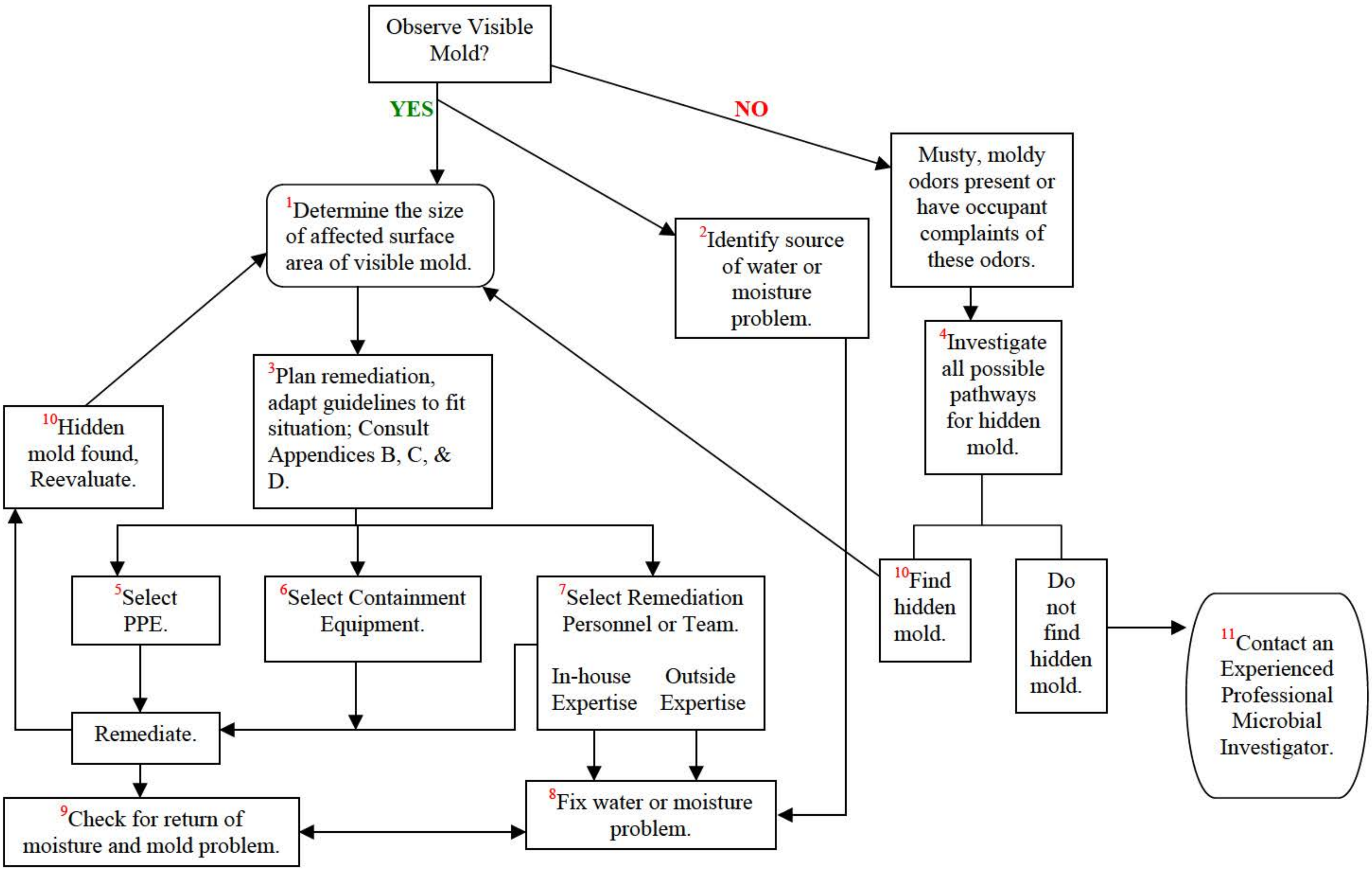
MOLD INVESTIGATION DECISION LOGIC



MOLD INVESTIGATION DECISION LOGIC NOTES:

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

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

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

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

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

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

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

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

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

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

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

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APPENDIX B

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

Mold Remediation Guidelines

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

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

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

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

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

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Disposable Protective Clothing

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

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

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

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

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

Full Containment

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

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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:	Easton Armory 7111 Ocean Gateway Easton, MD 21604
Prepared By:	Analytical Laboratory Services, Inc. 3544 North Progress Avenue Suite 100 Harrisburg, PA 17110
Survey Date:	September 16, 2010
Report Date:	November 1, 2010
ALSI Project #:	1009599

Non-Responsive
[redacted]

Director, Environmental Health & Safety

Table of Contents

Section 1.0
Executive Summary

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on September 16, 2010, at the Easton Armory located at 7111 Ocean Gateway, Easton, MD 21604. The survey was performed by Ms [redacted] and Mr. [redacted]

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

2. Lighting levels met the minimum recommended guidelines.

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.

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Section 2.0
Operation Description & Observations

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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 vinyl 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.

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Section 3.0
Noise Survey

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Section 3.0 Noise Survey

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

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Section 4.0
Lead Testing

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Section 4.0 Lead Testing

At the time of the assessment, no activities were observed which would generate lead exposure. The facility contains 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, Inc., in Lanham, Maryland, for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2
1	Drill Hall	<4.2	
2	Orderly Room #2	<4.3	
3	Blank	<3 (ug)	
4	Gym Converted Firing Range – Floor		<110
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 Maintenance 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 surface and air samples were collected. All sample results were less than recommended guidelines or regulatory standards

The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for

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

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

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Section 5.0
Lighting

Section 5.0 Lighting

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

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
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

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 (CO_2) levels ranged from 356 ppm to 513 ppm within the facility compared to an outdoor CO_2 level of 372 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,072 ppm (372 ppm + 700 ppm). Carbon monoxide (CO) ranged from 0.0 – 0.1 ppm.

The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	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**

Key: **Bolded** results exceed listed criteria

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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.

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Section 7.0
Suspect Asbestos Containing Building Materials

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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.

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Section 9.0
Limitations

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Section 9.0 Limitations

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

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

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Appendix A
Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Easton	**Chain Of Custody:**	508811
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Easton, MD	**Date Submitted:**	9/20/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	9/27/2010
Attention:	[redacted]			**Report Date:**	9/27/2010

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
1080600	1009599-1	Flame	Air	717	N/A	4.2	ug/m³	<3	<4.2	ug/m³	
1080601	1009599-2	Flame	Air	698	N/A	4.3	ug/m³	<3	<4.3	ug/m³	
1080602	1009599-3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1080603	1009599-4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080604	1009599-5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080605	1009599-6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080606	1009599-7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080607	1009599-8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080608	1009599-9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080609	1009599-10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080610	1009599-11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080611	1009599-12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080612	1009599-13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080613	1009599-14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080614	1009599-15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1080615	1009599-16	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. NVLAP® accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AIHA, NVLAP, NIST, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP 10920

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	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	[redacted]
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	9/27/2010 Report Date: 9/27/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

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

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

Air and Wipe results are not corrected for any blank results.
Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

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

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

Lom Butrak
Analyst: Lom Butrak

G Edward Carney
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 NY ELAP, AIHA, NVLAP, NIST, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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Page 1 of 2

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

508811

P) /r

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

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

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

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ____ ☐ 24 Hours Time Due: ____ Comments: ____	☐ Immediate ☐ 3 Day ☐ Next Day ☒ 5 Day + ☐ Results Required By Noon (Every Attempt Will Be Made to Accommodate) ☐ 2 Day Date Due: 9/27/10	☒ Includ[redacted]with Report ☒ Email[redacted]@analyticallab.com ☐ Fax: [redacted]@us.army.mil ☐ Verbal[redacted]@us.army.mil [redacted]1@cs.army.mil

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

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area) Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)
☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint C[redacted]
☒ Pb Dust Wipe (wipe type ____) 13 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

CLIENT ID NUMBER	SAMPLE INFORMATION SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER	SOIL	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
1009599-1	Drill Hall	9/16	716.9					X		X								Date/Time: Contact: By:
1009599-2	Orderly Rm #2		697.7					X		X								
1009599-3	Blank		0					X		X								
1009599-4	Gym Range - Fl Converted Fire			100cm²				X				X						
1009599-5	Gym Range - Top of Locker Converted Fire							X				X						Date/Time: Contact: By:
1009599-6	Gym Range - Table Converted Fire							X				X						
1009599-7	Fl Outside Gym Fire Range Center							X				X						
1009599-8	Drill Hall Floor Center							X				X						
1009599-9	Drill Hall Top of Bulletin Board							X				X						Date/Time: Contact: By:
1009599-10	Drill Hall Fl Outside Maintenance Office							X				X						
1009599-11	Top of Refrigerator Maintenance Office							X				X						
1009599-12	Orderly Rm #2 Cabinet			↓				X				X						

LABORATORY STAFF ONLY (CUSTODY)
1. Date/Time RCVD: 9/20/10 @ ____ Via: UPS By (Print): Nicole Maxwell Sign: [signature]
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ____ Sign: ____
3. Results Reported To: ____ Via: ____ Date: ____ / ____ / ____ Time: ____ Initials: ____
4. Comments: ____

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquiries) 508811

1-2/V

Mailing/Billing Information:

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

Submittal Information:

1. Job Name: Easton
2. Job Location: Easton, MD
3. Job #: ______ P.O. #: W912K6-09-A-0003
4. Contact Perso[redacted] @ phone #: (410) 942-0273
5. Submitted by: [redacted]

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

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

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

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ Em[redacted] @us.army.mil
☐ Fax [redacted] @us.army.mil
☐ Verb

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

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

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

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

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

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER/OTHER	WIPE/SOLID	TAPE	SWAB
1009599-13	Top of Filing Cabinet Commanders Office	9/16		100cm²				X				X				
1009599-14	Kitchen Floor	↓		↓				X				X				
1009599-15	Top of Locker Mens Locker Rm	↓		↓				X				X				
1009599-16	Blank	↓		0cm²				X				X				

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

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

Appendix B
Photographs

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Easton MD
Exterior

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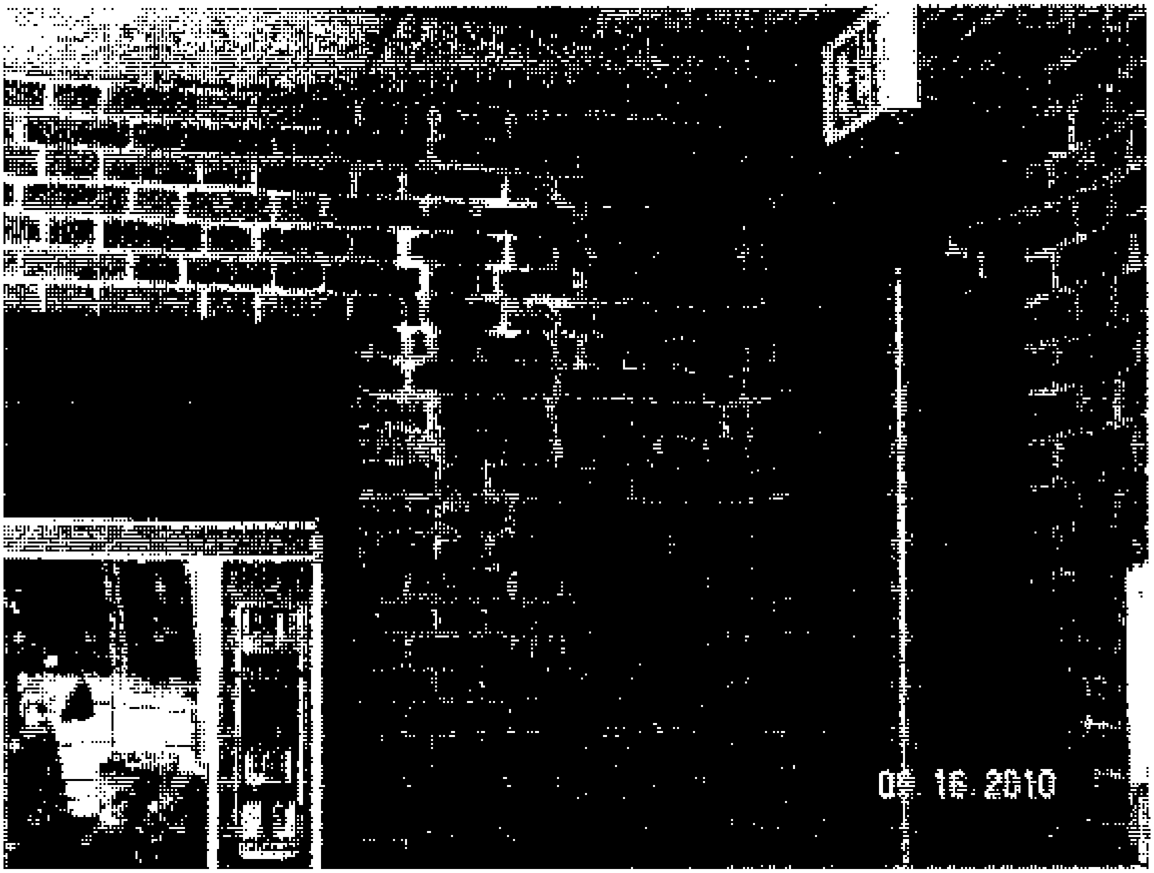
Easton MD
Drill Hall



Easton MD
Drill Hall   Water Damage on Brick Wall

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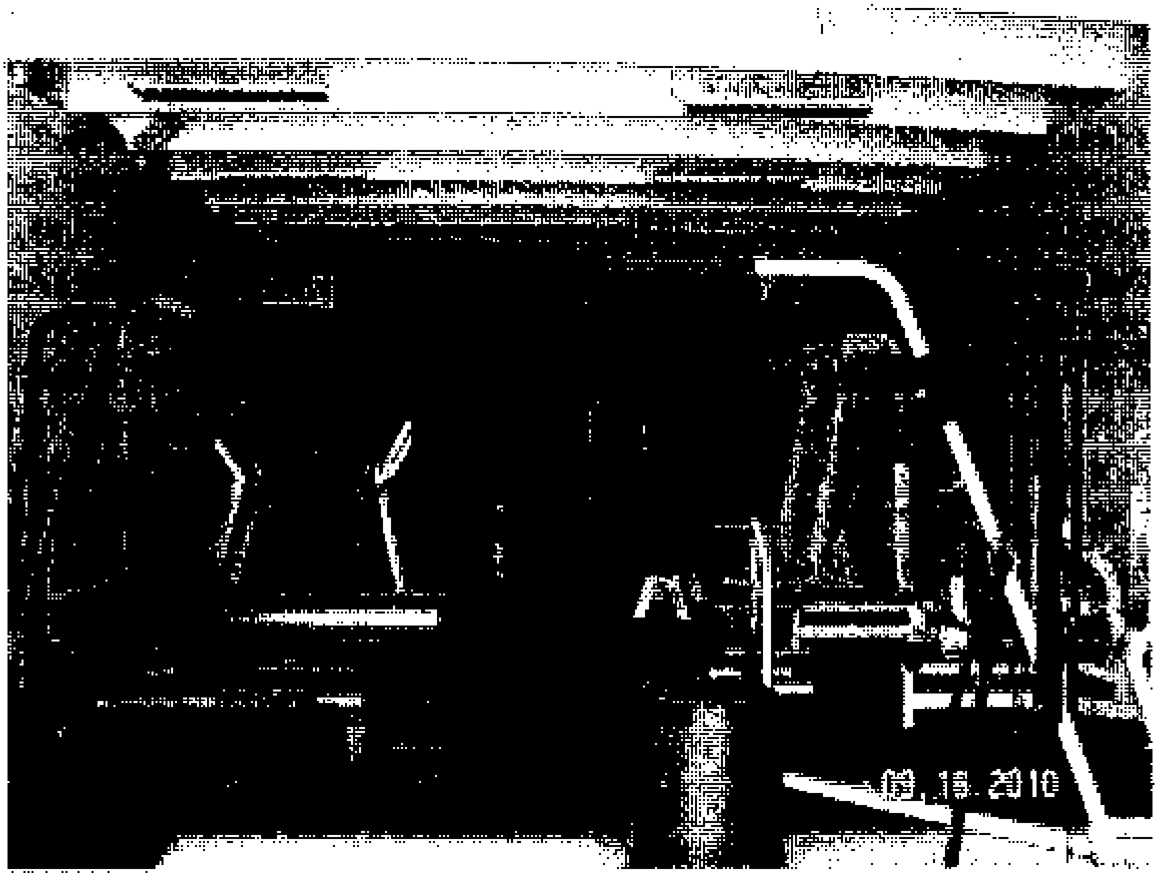

Easton MD
Converted Firing Range (Gym)

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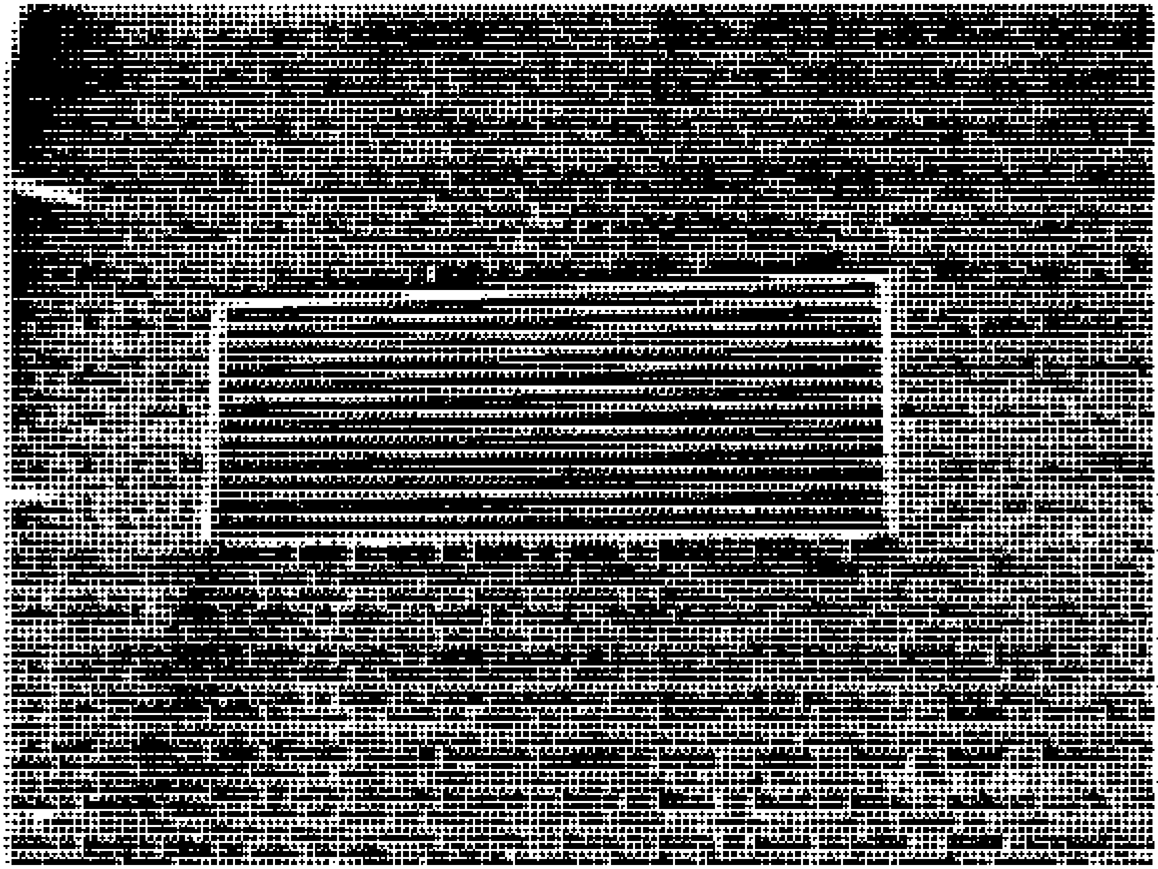
Easton MD
Boiler Room



Exterior   Fresh Air Intake

Appendix C
Floor Plan

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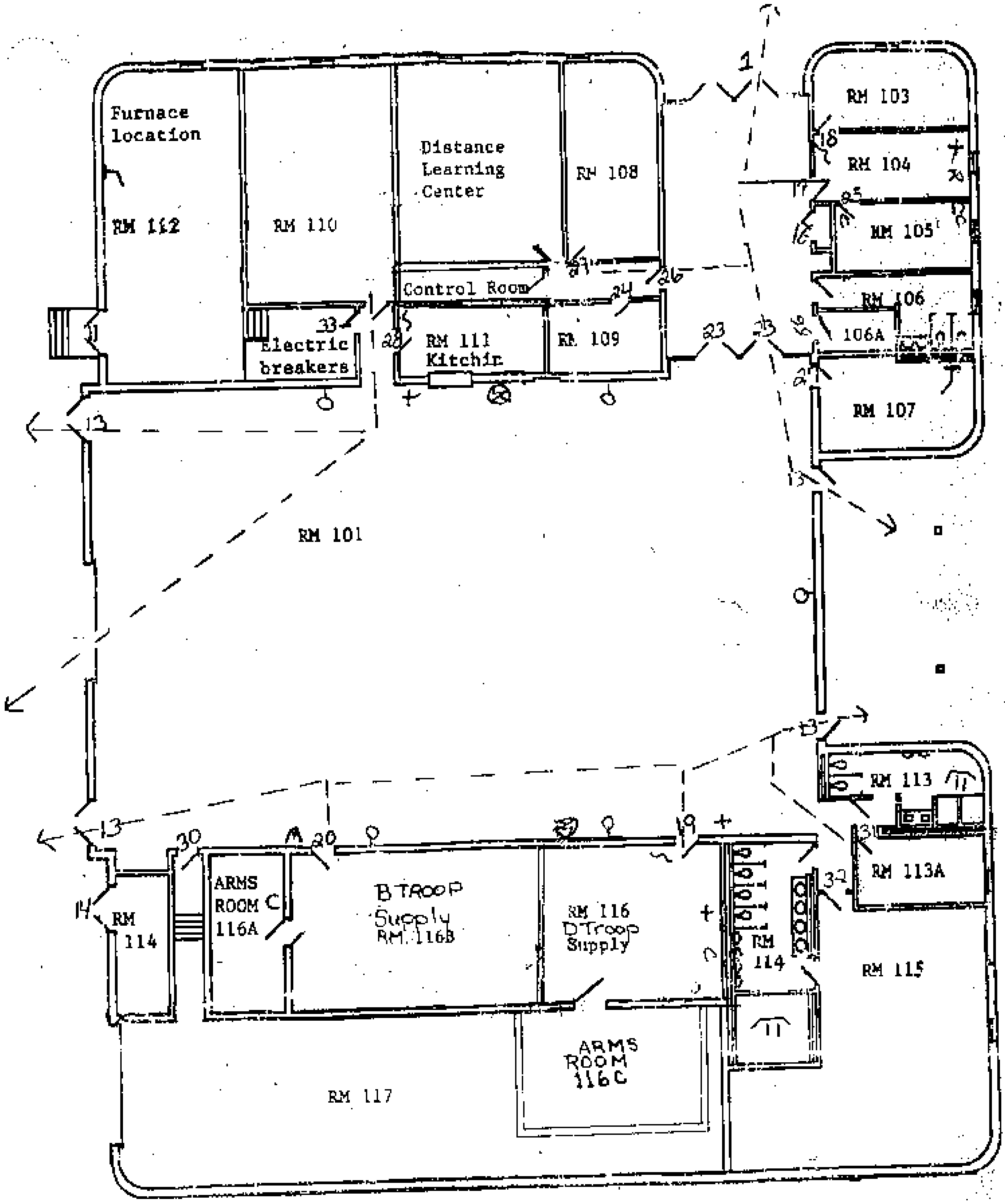

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EASTON ARMORY

Appendix D
References

Appendix D. References

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

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

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

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

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

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

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

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

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

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

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COMPLIANCE MANAGEMENT INTERNATIONAL

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**

[redacted]

[redacted]
Senior Industrial Hygienist

Table of Contents

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. [redacted], 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/ft^2. See Section 3.0 for sampling results.

2. Lighting levels did not meet the American National Standard Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in the 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.

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Section 3.0 Lead Testing

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

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2
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

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/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 at or above the recommended guideline of 200 ug/ft^2 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/m^3).

- There was no chipping or peeling paint observed in the facility.

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Section 4.0 Lighting

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

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
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

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.

IAQ Assessment Summary

Location	Temperature (◦F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (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 Office	73.8	42.8	521	2.6
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**

Table Notes:

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

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

Summary of findings and recommendations:

- Temperature 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.

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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.

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Section 7.0 Equipment

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

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	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

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AMA Analytical Services, Inc.
A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

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

Client:	National Guard Bureau	**Job Name:**	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:**	[redacted]		
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	12/16/2012	**Report Date:**	12/16/2012

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
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/ft²	
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/ft²	
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/ft²	
13021240	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13021241	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
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	
13021246	17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13021247	18	Flame	Wipe	****	0.108	110	ug/ft²	<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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LAB #100470

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:**	[redacted]		
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	12/16/2012	**Report Date:**	12/16/2012

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

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

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)
%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.
Air and Wipe results are not corrected for any blank results
Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.
All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

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

Kim Shipe

Analyst: Kimberly D. Shipe

Technical Manager: G Edward Carney

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **514700**

(page 1 of 2)

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

Submittal Information:
1. Job Name:
2. Job Location:
3. Job #: [redacted] PO #: W912K6-09-A-0003
4. Contact Pers[redacted] @ phone # (410) 942-0273
5. Submitted By [redacted] Signature [redacted]

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

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day + Date Due: 12/17/12 ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ Include COC/Field Data Sheets with Report ☒ Email: [redacted]@us.army.mil ☐ Fax: ☐ Verb[redacted]@us.army.mil

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

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

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

Metals Analysis
☐ Pb Paint Chip ____(QTY)
☐ Pb Dust Wipe (wipe type Ghost) 18 (QTY)
☐ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____(QTY)
☐ Pb TCLP ____(QTY)
☐ Drinking Water ☐ Pb ____(QTY) ☐ Cu ____(QTY) ☐ As ____(QTY)
☐ Waste Water ☐ Pb ____(QTY) ☐ Cu ____(QTY) ☐ As ____(QTY)
☐ Pb Furnace (Media ____) ____(QTY)

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

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
1	Rm 103	12/4/12	455					X		X	Not Not Submitted						Date/Time: Contact: By:
2	Drill Hall	12/4/12	450					X		X	Not Submitted						
3	Drill Hall Floor	12/4/12		160 cm²				X									Lead Air samples NOT submitted.
4	D.H. Cabinet	12/4/12						X									
5	D.H. Vending	12/4/12						X									Date/Time: Contact: By:
6	D.H. Cabinet	12/4/12						X									
7	D.H. Return	12/4/12						X									
8	Rm 117 Floor	12/4/12						X									
9	Rm 117 Supply	12/4/12						X									Date/Time: Contact: By:
10	Rm 117 Light	12/4/12						X									
11	Rm 117 Locker	12/4/12						X									
12	Rm 117 Floor	12/4/12						X									

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 12/10/12 @ 1000 Via: FedEx By (Print): NEM Sign:
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ___ Sign: ___
3. Results Reported To: ___ Via: ___ Date: ___/___/___ Time: ___ Initials: ___
4. Comments: FS 7939 3323 1840

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May, 2018

2 of 2

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 514700 (page 2 of 2)

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

Submittal Information:
1. Job Name:
2. Job Location:
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person Non-Responsive [redacted] Non-Responsive [redacted]0273
5. Submitted by: [redacted] Signature: [redacted]

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

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

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

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

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

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

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

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

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
13	Rm 117 Floor Out	12/4/12		100 cm²				X									Date/Time: Contact: By:
14	Rm 115 Locker	12/4/12						X									
15	Rm 103 Desk	12/4/12						X									
16	Rm 111 Kitchen	12/4/12						X									
17	Rm 110 Fridge	12/4/12						X									Date/Time: Contact: By:
18	Rm 108 Desk	12/4/12						X									
19	DLC Table	12/4/12		✓				X									
20	Blank	12/4/12		0				X				~~Not Submitted~~ NRM					
21	Blank	12/4/12	0					X		Y		Not Submitted					Date/Time: Contact: By:

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

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May, 2018

FOIA Requested Record #J-15-0085 (MD)
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ISO/IEC 17025:2005
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LAB #100470

Client:	National Guard Bureau	**Job Name:**	Easton RC	**Chain Of Custody:**	514784
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Easton, MD	**Date Submitted:**	12/13/2012
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	12/17/2012 **Report Date:** 12/17/2012

Attention: [redacted]

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 (ft^2)	Reporting Limit		Total ug	Final Result		Comments
13022545	1	Flame	Air	455	N/A	6.6	ug/m^3	<3	<6.6	ug/m^3	
13022546	2	Flame	Air	450	N/A	6.7	ug/m^3	<3	<6.7	ug/m^3	
13022547	21	Flame	Air Blank	0	N/A	3	ug/m^3		<3	ug	

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

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

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

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

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

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

Air and Wipe results are not corrected for any blank results

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

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

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

Analyst: Suphin Chinnapad

Technical Manager: G Edward Carney

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CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 514784

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

Submittal Information:
1. Job Name: EASTON RC
2. Job Location: EASTON, MD
3. Job #: [redacted] PO #: W912K6-09-A-0003
4. Contact Person [redacted]
5. Submitted By: [redacted] Signature: [redacted]

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

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

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

REPORT TO:
☑ Include COC/Field Data Sheets with Report
☑ Email: [redacted]@us.army.mil
☐ Fax: [redacted]@us.army.mil
☐ Verbal: [redacted]

Asbestos Analysis

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

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

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

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

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

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

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

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

Metals Analysis
☐ Pb Paint Chip ______(QTY)
☐ Pb Dust Wipe (wipe type ______) ______(QTY)
☑ Pb Air 3 (QTY)
☐ Pb Soil/Solid ______(QTY)
☐ Pb TCLP ______(QTY)
☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Pb Furnace (Media ______) ______(QTY)

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

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1	Rm 103	12/4/12	455					X								
2	DRILL HALL	12/4/12	450					X								
21	BLANK	12/4/12	0					X								

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

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 12 / 13 / 12 @ 1015 Via: FedEx By (Print): David Hutson Sign: [signature]
2. Date/Time Analyzed: ____/____/____ @____ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ____/____/____ Time: ______ Initials: ______
4. Comments: 2431 3323 1325

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Appendix B. Photographs

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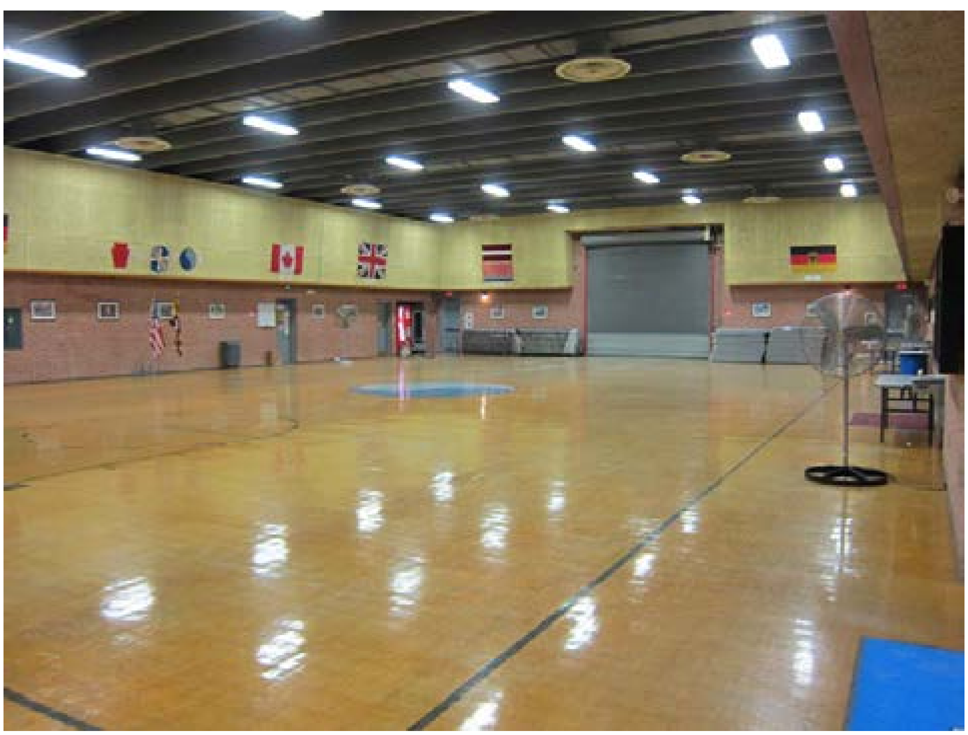
Exterior of Building



Drill Hall

Converted Firing Range

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Appendix C. Floor Plan

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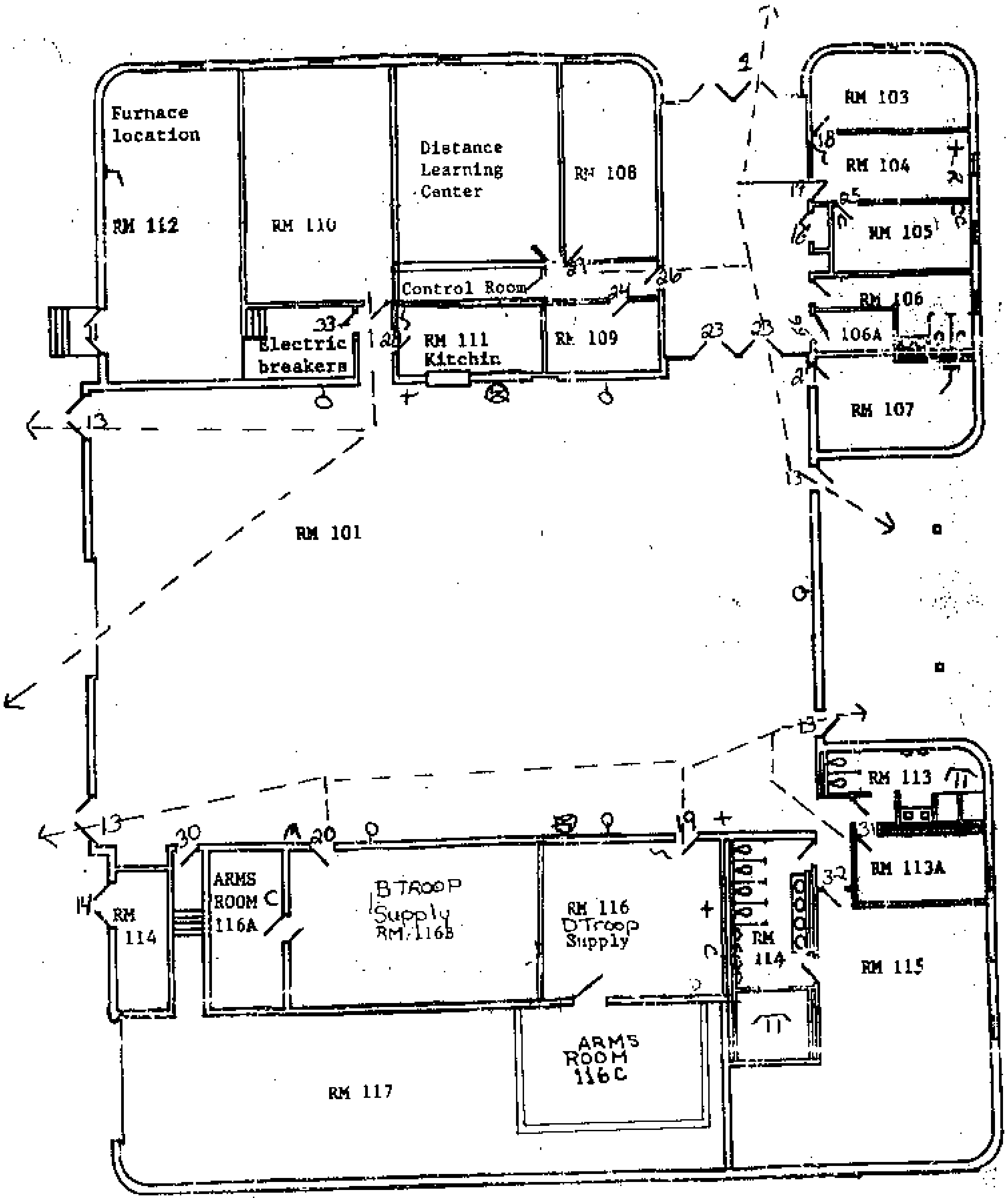
Furnace location
RM 112
RM 110
Distance Learning Center
RM 108
Control Room
Electric breakers
RM 111 Kitchin
RM 109
RM 103
RM 104
RM 105
RM 106
106A
RM 107
RM 101
RM 113
RM 113A
ARMS ROOM C 116A
B TROOP Supply RM 116B
RM 116 D Troop Supply
RM 114
RM 114
RM 115
ARMS ROOM 116C
RM 117

Appendix D. References

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

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

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

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

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

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

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

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

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

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

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

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

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

REPLY TO
ATTENTION OF

MCHB-TS-OFS

May 2004

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

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03 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. [redacted], at DSN 584-5475/3118, commercial (410) 436-5475/3118 or e-mail address at [redacted]@apg.amedd.army.mil.

ENCL

[redacted]
Industrial Hygienist
Industrial Hygiene Field Services Program

Readiness thru Health
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May, 2018

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

USACHPPM

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

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

Approved for public release; distribution unlimited.

Readiness Thru Health

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

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

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

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

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

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

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

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

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

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

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

EXECUTIVE SUMMARY
MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS, 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 200µg/ft² 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

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 $40 \mu g/ft^2$ on floors and clean to the USACHPPM decontamination level of $200 \mu g/ft^2$ for dust-lead on all other surfaces. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities 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.

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

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

REPLY TO
ATTENTION OF

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

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

LOCATION: Edgewood Armory, Edgewood MD

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

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

3. BACKGROUND INFORMATION.

a. Armory Mission. Administration.

b. Date of Construction. Built in 1983.

c. POC. MSG [redacted], armory manager, 410-436-2423 and Ms. [redacted], 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.

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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 200µg/ft² 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 200µg/ft² of dust-lead are highlighted.

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

Table 1: Sample Locations, Photograph numbers, and Analytical Results

Sample Numbers	Type of Sample	Location	Photo	Result 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 room)	1024	<110
AB W05	Wipe	Drill Floor (table on left side of drill room)	1025	<110
AB W06	Wipe	Former IFR baffle area	1028	8000
AB W07	Wipe	Former IFR middle of floor	1029	260
AB W08	Wipe	Former IFR floor (rear)	1030	850
AB W09	Wipe	Former IFR rear storage room floor	1031	1600
AB W10	Wipe	Former IFR acoustical wall panel	1032	<110
AB W11	Wipe	Former IFR perforated metal soundproofing panel	1033	1600
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 Samples				Parts Per 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

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.

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b. Lead. Five of fourteen dust-lead wipe sample results exceeded the USACHPPM recommended decontamination level of 200µg/ft² 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-mai[redacted]apg.amedd.army.mil.

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

ENCLOSURE

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/ft^2 on floors and clean to the USACHPPM decontamination level of 200µg/ft^2 for dust-lead on all other surfaces. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities 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.

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APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

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Subject: Proposed Recommendations for Surface Lead in Armories

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

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

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

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

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

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

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

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

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

APPENDIX B

SITE MAPS

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N Manager

Sgt Non-Responsive

Mr Non-Responsive CW4.

1RST Floor

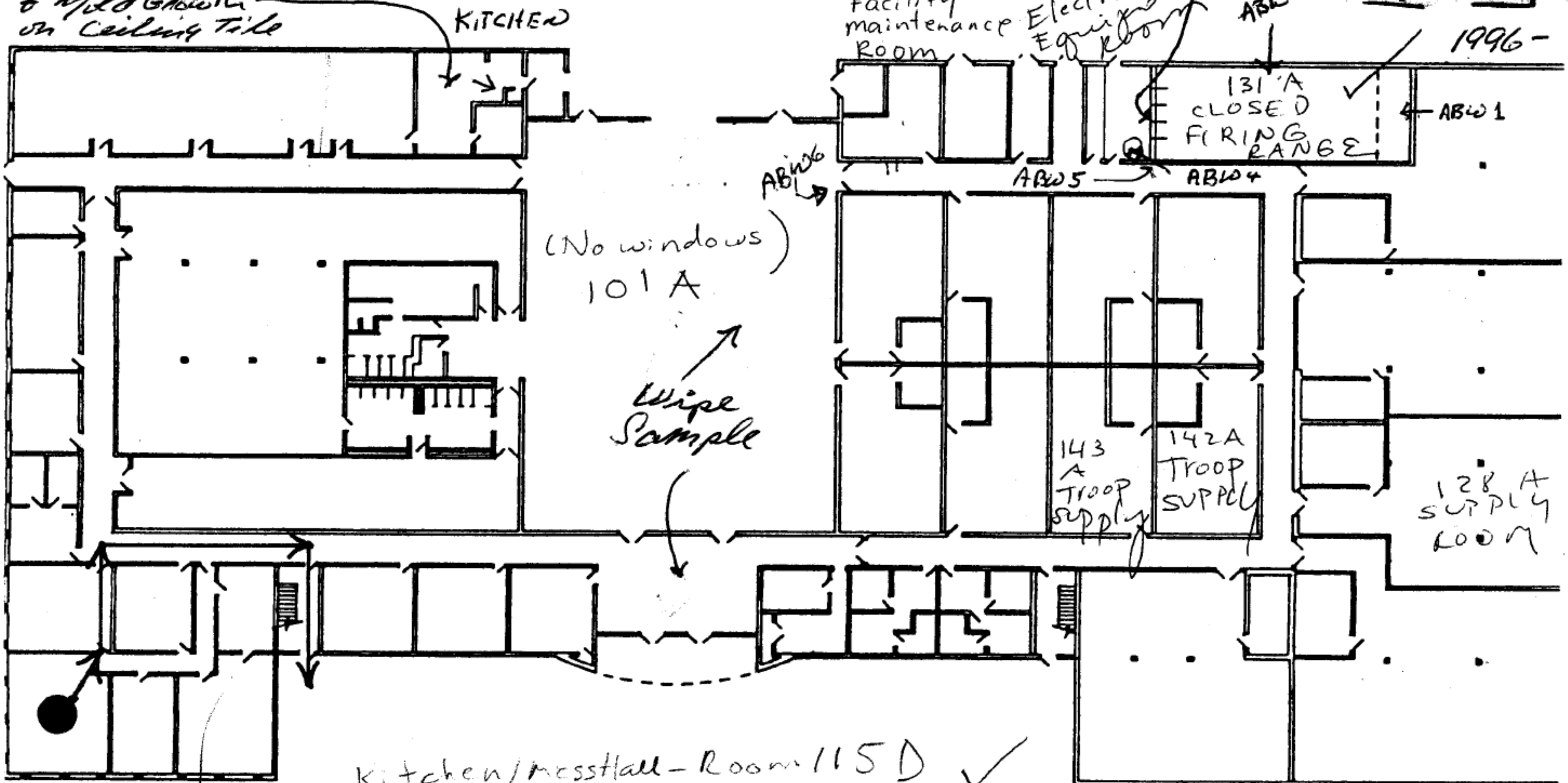
EMERGENCY EVACUATION PLAN

Water Damage & Mold Growth on Ceiling Tile

ABW3 Ceiling Heater

~~Wipe~~ Sample

1996 -



Wipe Sample

Use Lead Checks -

air sample for full-time ...of the NGB

● **YOU ARE HERE**

* Look for Mold Damage

Floor

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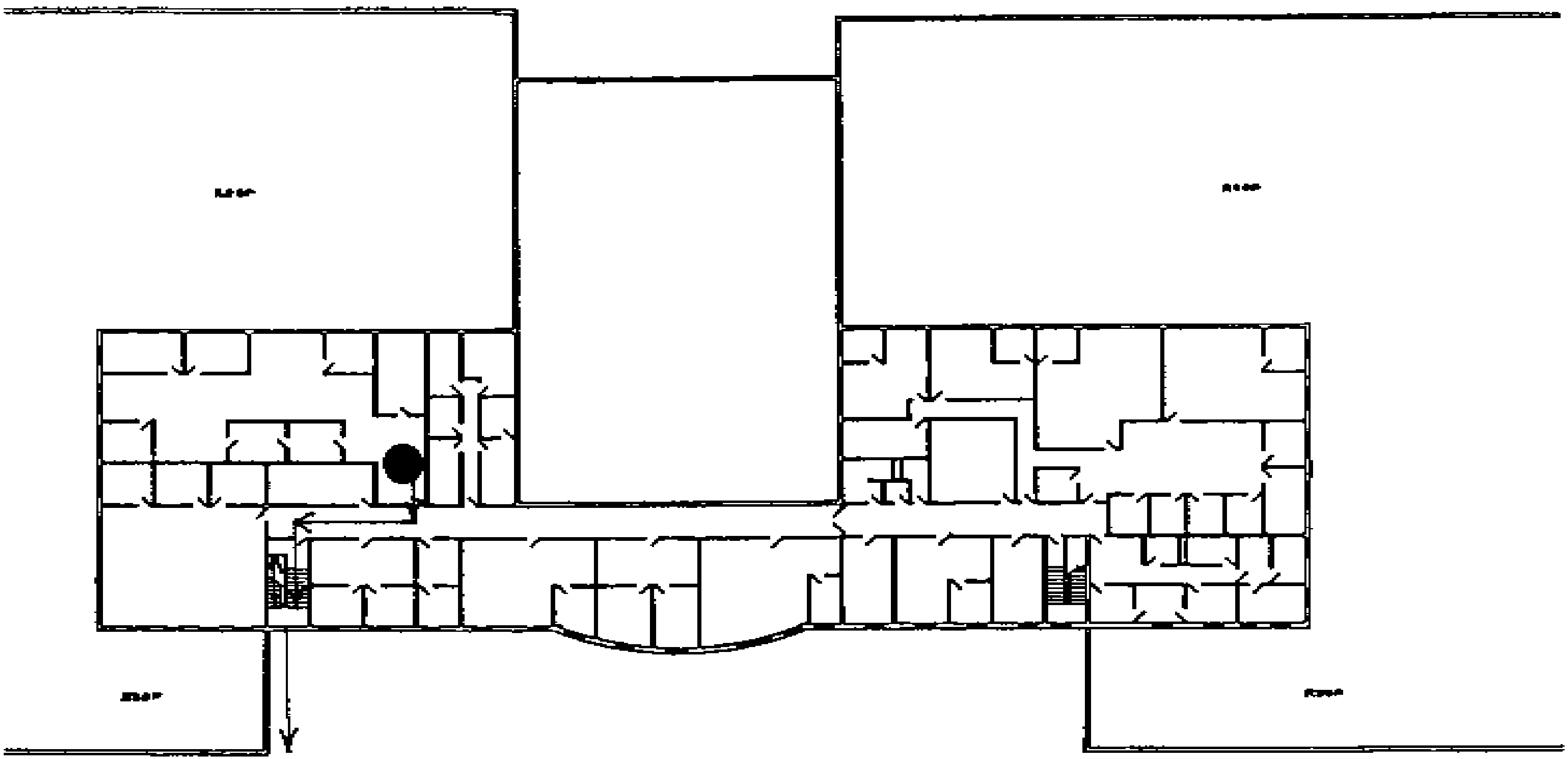
EMERGENCY EVACUATION PLAN



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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 [redacted] and SFC [redacted]

Resident Units:

- 29th Aviation Brigade, 29th Infantry Division (Light)
  - Headqurters & 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
  - 129th Air Traffic Services Company (Div)
  - 104th Medical Company (Air Ambulance)
- MDNG Military Youth Corps (ChalleNGe)
- Mobilization AVCRAD Control Element
- Operational Support Airlift Detachment

Building #A1060

- Organizational Maintenace Shop #11

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APPENDIX C

PHOTOGRAPHS

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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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APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

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			Indoor Range Info					
Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (µg/ft²)
				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

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Client:	US Army - CHPPM	**Job Name:**	National Guard	**Chain Of Custody:**	116953
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Aberdeen/Edgewood Armoy	**Date Analyzed:**	10/10/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	Non-Responsive [redacted]
		P.O. Number:	Not Provided	**Report Date:**	10-Oct-03

Attention: Non-Responsive [redacted]

Summary of Atomic Absorption Analysis for Lead

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

J Willoughby

Analyst: Jodi Willoughby **Technical Manager:** G Edward Carney

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Client:	US Army - CHPPM	**Job Name:**	Aberdeen Armory	**Chain Of Custody:**	116944
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	10/2/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[redacted] Non-Responsive
		P.O. Number:	Not Provided	**Report Date:**	02-Oct-03
Attention:	[redacted] Non-Responsive				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
0400454	ABWBlank 1	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	
0400455	ABW 01	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0400456	ABW 02	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0400457	ABW 03	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0400458	ABW 04	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0400459	ABW 05	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
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/ft²		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	

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Client:	US Army - CHPPM	**Job Name:**	Aberdeen Armory	**Chain Of Custody:**	116944
Address:	Attn: MCHB-TS-OFS, 5158 Blackhawk Road	**Job Location:**	Not Provided	**Date Analyzed:**	10/2/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Report Date:**	02-Oct-03
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

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

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

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

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

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

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

Analyst: Daniel P. Swanson   **Technical Manager:** G Edward Carney

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REFERENCES

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APPENDIX E

REGULATIONS AND STANDARDS

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

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

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

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

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

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

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

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

APPENDIX F

LEAD CLEANING GUIDANCE

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Chapter 14: Cleaning

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.

2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.

3. Have sufficient cleaning equipment and supplies *before* beginning work.

4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.

5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.

6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.

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

8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.

9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.

10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.

11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.

12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.

13. Paint or otherwise seal treated surfaces and interior floors.

14. Conduct a clearance examination (see Chapter 15).

15. If clearance is not achieved, repeat the final cleaning.

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

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

18. Cleaning equipment list:

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

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Chapter 14: Cleaning

I. Introduction

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

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

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

A. Performance Standard

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

B. Small Dust Particles

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

C. Difficulties in Cleaning

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

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

1. Low Clearance Standards

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

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

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

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

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2. Worker Inexperience

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

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

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

4. Deadlines

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

II. Coordination of Cleaning Activities

A. Checklist

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

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

B. Equipment Needed for Cleaning

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

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C. Waste Disposal

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

III. Cleaning Methods and Procedures

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

A. Containment

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

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

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

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

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

1. HEPA Vacuuming

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

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

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Operating Instructions

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

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

Special Attachments

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

Selecting Appropriate Size(s)

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

Wet-Dry HEPA Vacuums

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

Prefilters

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

HEPA Vacuuming Procedures

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

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

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

Emptying the HEPA Vacuum

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

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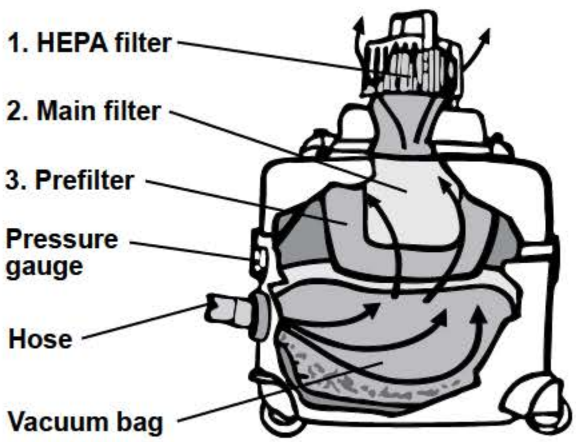
Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

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

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

2. Wet Detergent Wash

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

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

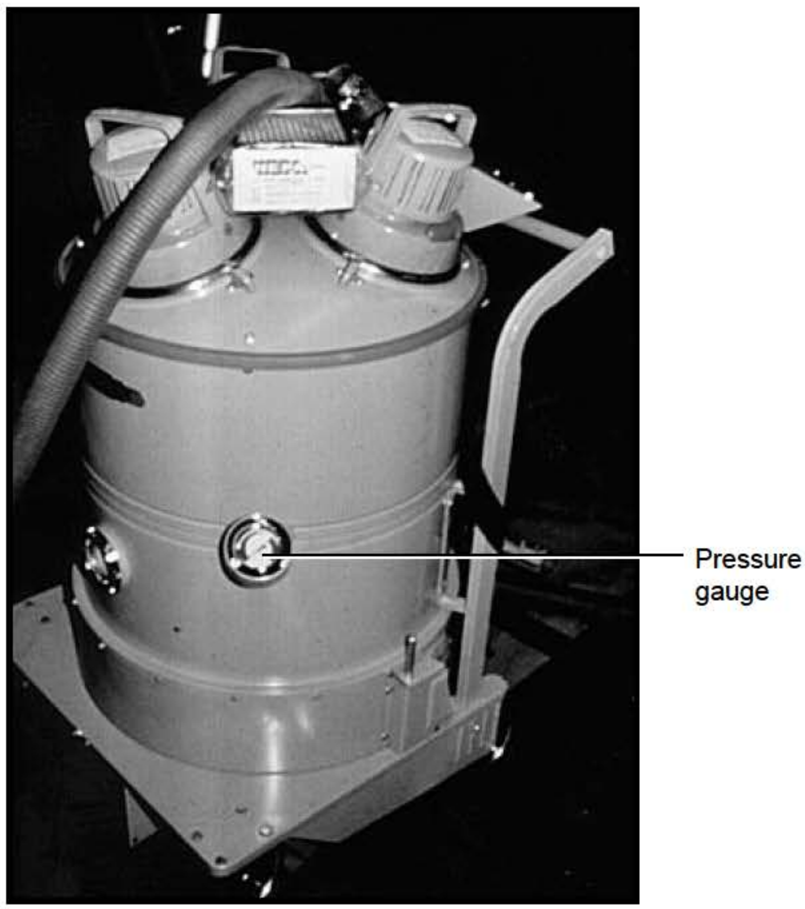


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

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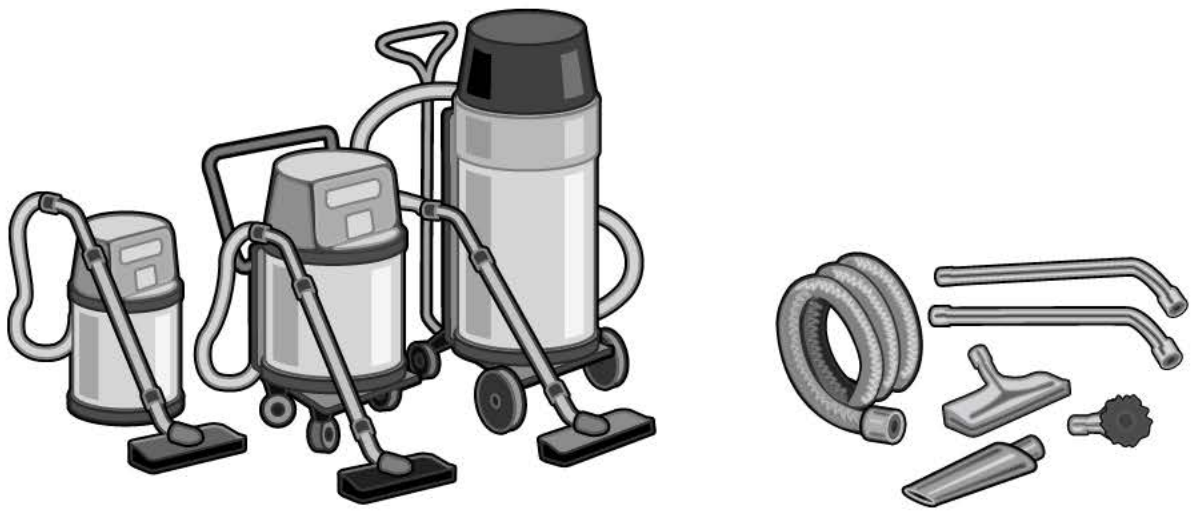
Figure 14.2 HEPA Vacuum Sizes and Tools.



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

Manufacturer's Dilution Instructions

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

Appropriate Cleaning Equipment

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

Proper Wet-Cleaning Procedures

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

Changing Cleaning Mixture

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

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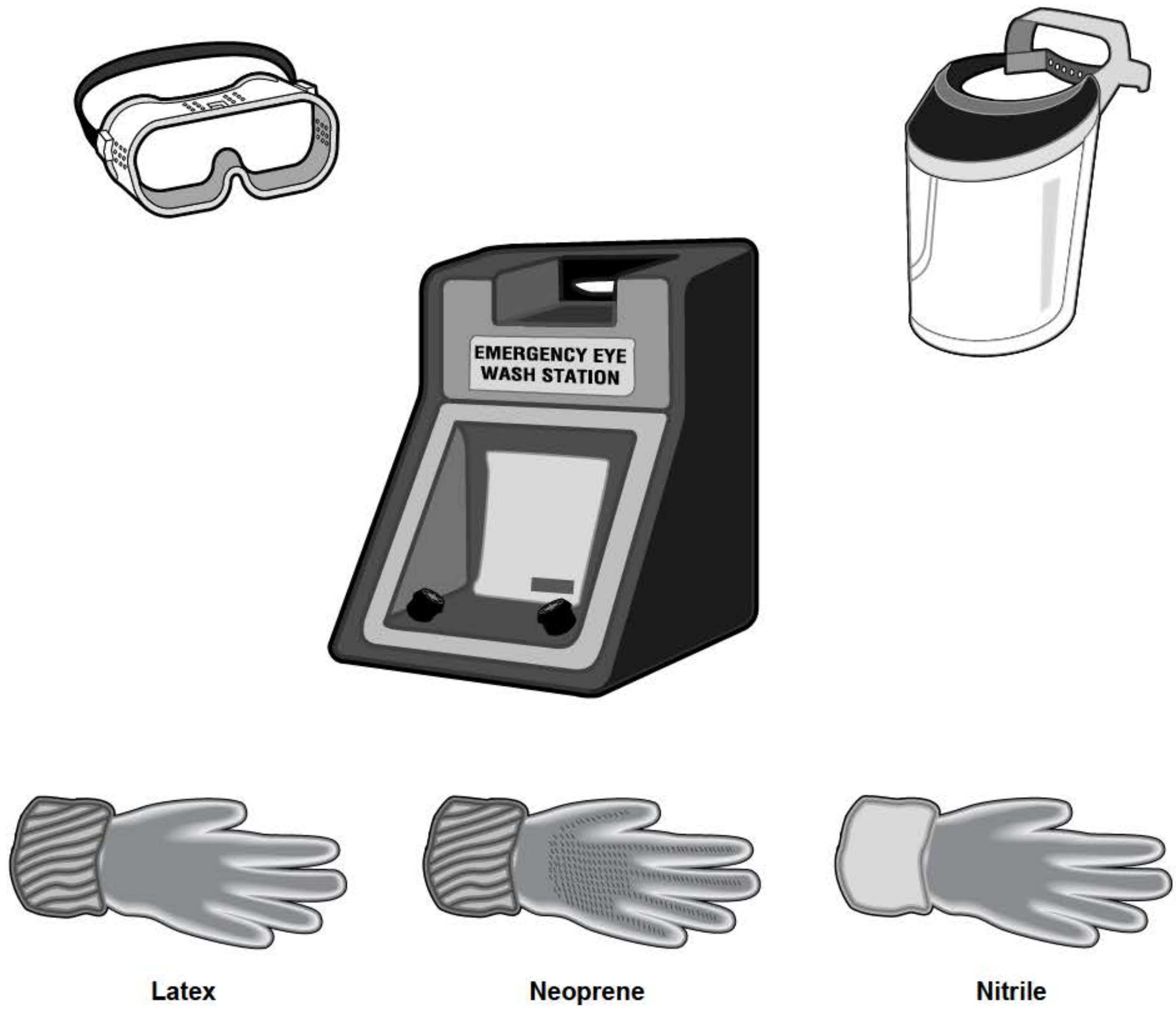
Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



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

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

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

- First, the area is HEPA vacuumed.

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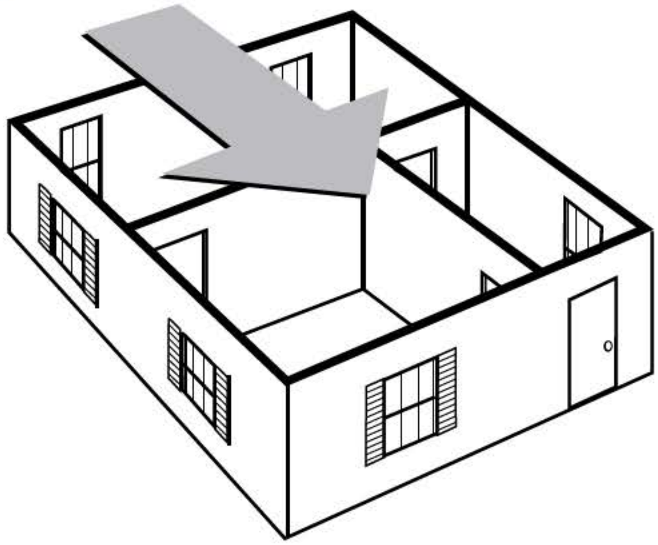
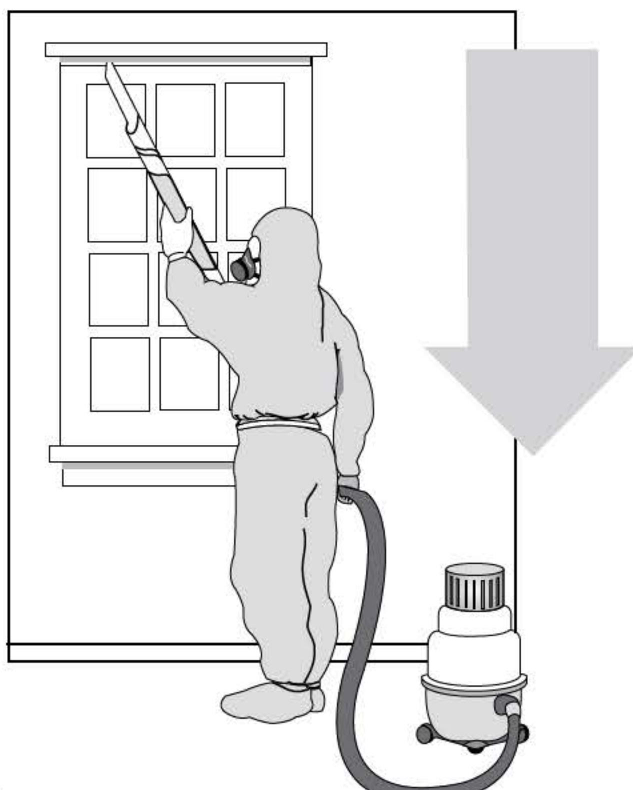
Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

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



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



Courtesy: Alice Hamilton Occupational Health Center

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

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

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

Single-Pass Wet Wash/HEPA Vacuum

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

Figure 14.4b (continued)

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

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

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

Rubber Cone

Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

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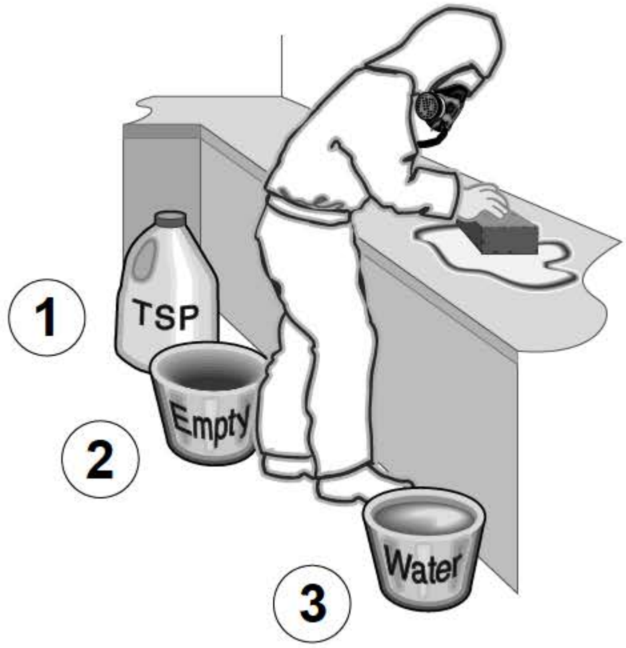
Figure 14.4c (continued)

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



Wipe All Surfaces

Wet Mop Floor

Don't Dry Sweep

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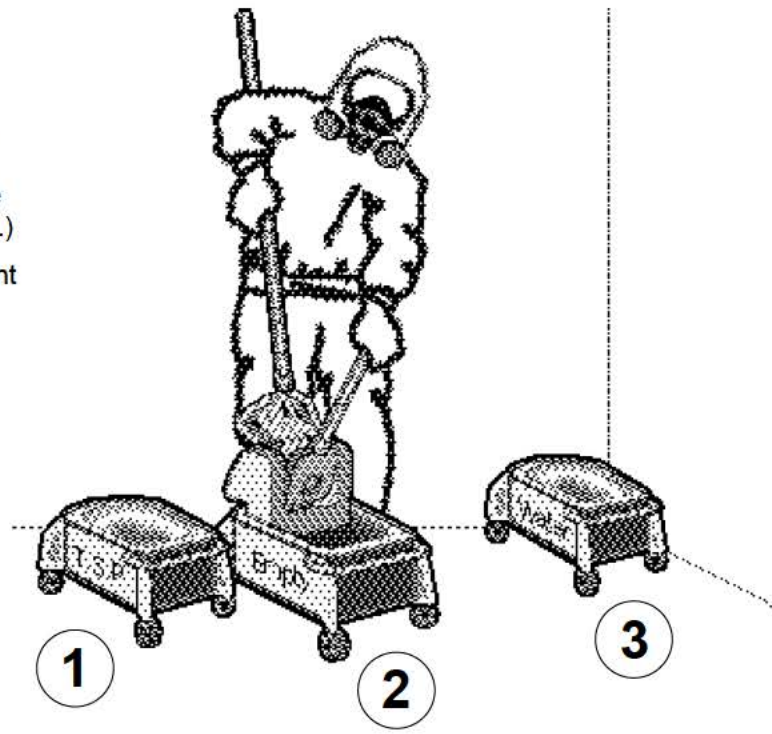
Figure 14.4c (continued)

Use the 3-Bucket System.

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

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



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

Use the third bucket for rinsing the floor.

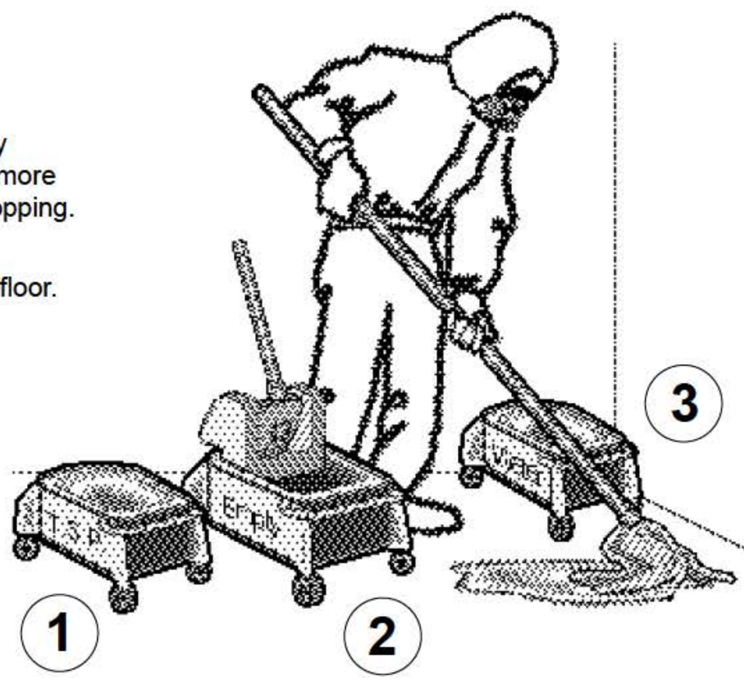


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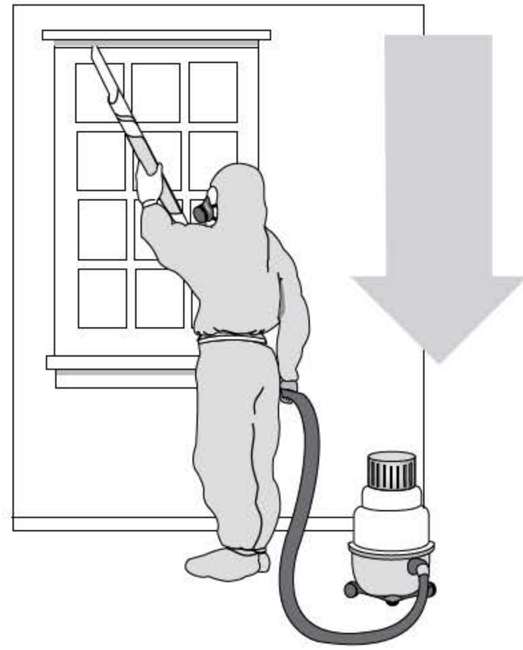
Figure 14.4d (continued)

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

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



4. Sealing Floors

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

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

IV. Order of Cleaning Procedures During Lead Hazard Control

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

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

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Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.

Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

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belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

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containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water *and cleaned.* All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

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the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).

Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This

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option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dust-retaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table 14.1 Initial Cleaning Wipe-Test Failure Rates for Various Abatement Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)

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and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993).

These *Guidelines* do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Cycle Number	Mass Removal Efficiency Percentages			
	Cleaning Method			
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.8	67.0	29.4
5	59.3	88.9	72.1	32.5
6	61.6	91.2	74.4	34.9
7	63.8	93.1	76.4	36.5
8	67.5	95.4	77.5	38.1
9	67.5	97.7	78.7	40.1
10	67.2	100.0	80.2	41.7
11		102.3	80.2	41.7
12		104.6	84.1	44.8
13		104.6	84.5	46.8
14		103.8	84.5	48.4
15				49.6
16				50.8
17				52.4
18				53.6
19				54.4
20				55.2

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) *Effectiveness of Clean-up Techniques for Leaded Paint Dust*

APPENDIX G

MOLD GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

TG 277

FEBRUARY 2002

USACHPPM

Readiness thru Health

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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Use of company or trademarked names does not imply endorsement by the U.S. Army but is intended only to assist in identification of a specific product.

ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

Concern about indoor exposure to mold has been increasing as the public becomes more aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions.

This document provides the best and most current guidance for remediation of clean water damage (<48 hours) and mold contamination (>48 hours) into one resourceful Army guide. This guide has been designed to provide information to facilities management individuals who have little or no experience with mold remediation. It will assist them in making a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to develop or evaluate an in-house remediation plan or evaluate a remediation plan submitted by an outside contractor. If an outside contractor is employed, they must have experience cleaning up mold. Check their references, and have them follow the recommendations presented in this document, EPA guidelines, and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). A multi-disciplinary team approach to mold concerns is best. A health and safety professional, such as an industrial hygienist, should be consulted prior to any remediation activities to assist in the project.

Molds produce tiny spores to reproduce. Mold spores float through the indoor and outdoor air continually. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or uncorrected. There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.(1)

In all situations, the underlying cause of water accumulation must be rectified or mold growth will recur. Any initial water infiltration should be stopped and clean up began immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth. (Refer to Appendix A for detailed guidance on clean water damage response). If the source of water is elevated humidity, actions to maintain the relative humidity levels below 60% to inhibit mold growth should be taken (2). Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilating, and air-conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide adequate drainage and slope the ground away from the foundation.

REMEDIATION PLANNING

- Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Select cleanup methods for moldy items (Appendix B)
- Select Personal Protection Equipment (PPE)- protect remediators (Appendix B)
- Select containment equipment - protect building occupants (Appendix B)
- Select remediation personnel who have the experience and training needed to implement the remediation plan and use PPE and containment as appropriate

REMEDIATE MOISTURE AND MOLD PROBLEMS

- Fix moisture problem, implement repair plan and/or maintenance plan
- Dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Clean and dry moldy materials (Appendix B)
- Discard moldy porous items that can't be cleaned (Appendix B)

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REMEDIATION PROCEDURES

Four levels of abatement are described below. The size of the area impacted by mold contamination primarily determines the type of remediation. The sizing levels below are based on professional judgment and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of mold and preventing dust contaminated with mold from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement. The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. (3)

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be discarded if possible. All materials to be reused should be dry and visibly free from mold. Routine inspections should be conducted to confirm the effectiveness of remediation work. (1 and 3)

The use of bleach or other biocides is questionable in most cases (8). The effectiveness of bleach in reducing living mold is dependent on concentration, residual chlorine levels, and contact time on the surface (8). All of these factors are difficult to control during remediation. Removal of all mold growth can generally be accomplished by physical removal of materials supporting active growth and thorough cleaning of non-porous materials (4). Therefore, application of a biocide serves no purpose that could not be accomplished with a detergent or cleaning agent (4).

The use of gaseous ozone or chlorine dioxide for remedial purposes is **not** recommended. Both compounds are highly toxic and contamination of occupied space may pose a health threat. Furthermore, the effectiveness of these treatments is unproven. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."(4)

FOUR REMEDIATION LEVELS

[Adapted from NYCDOH Guidelines on Assessment and Remediation of Fungi in Indoor Environments (3) and EPA (1)]

Level I: Small Isolated Areas – Total surface area affected less than 10 square feet - e.g., ceiling tiles, small areas on walls. Refer to Appendix B for detailed guidance.

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Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas used by remediation workers for egress should be cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Level II: Medium – Total Surface Area affected between 10 and 100 square feet - e.g., several wallboard panels. (See Appendix B for detailed guidance).

The following procedures *at a minimum* are recommended:

Refer to Appendix C for proper PPE selection. Limited or Full protection may be required depending on the situation.

Refer to Appendix D for Containment procedures.

The work area and areas directly adjacent should be covered with a single layer of 6 mil fire-retardant polyethylene sheet(s) and taped before remediation, to contain dust/debris.

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Seal ventilation ducts/grills in the work area and areas directly adjacent with 6 mil polyethylene sheeting. Use an exhaust fan with a High Efficiency Particulate Air (HEPA) filter to generate negative pressurization.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and surrounding areas should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level III be followed.

Level III: Large Area – Total Surface Area affected greater than 100 square feet or potential for increased occupant or remediator exposure during remediation is estimated to be significant. (See Appendix B for detailed guidance).

The following procedures are recommended:

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from occupied spaces using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

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The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft^2) follow Level I guidance for PPE and containment and for a areas (>10 ft^2) follow Medium (Level II) or when greater than 100 ft^2 follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

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Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended (7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

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Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and removed in double-bagged 6-mil plastic. When a decontamination room is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

All areas should be left dry and visibly free from contamination and debris.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air (4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If remediation sampling is necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HAZARD COMMUNICATION

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

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CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.

3. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force,* AIHA Press, Fairfax, VA, May 2001.

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APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water Damage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£	
Water-Damaged Material†	**Actions**
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours§	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans.
Ceiling tiles	• Discard and replace.
Cellulose insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	• Discard and replace.

Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling should be pried away from wall for drying

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£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.
These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

† If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

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APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft²)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

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MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2

Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		

LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant

Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

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Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

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APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

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Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

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APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

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the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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TG 277

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*[1] will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination[2].

Safety Tips While Investigating and Evaluating Mold and Moisture Problems[3]

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate[1].

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems[3].

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination[2].

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air[4]. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control[4]."

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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.

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APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

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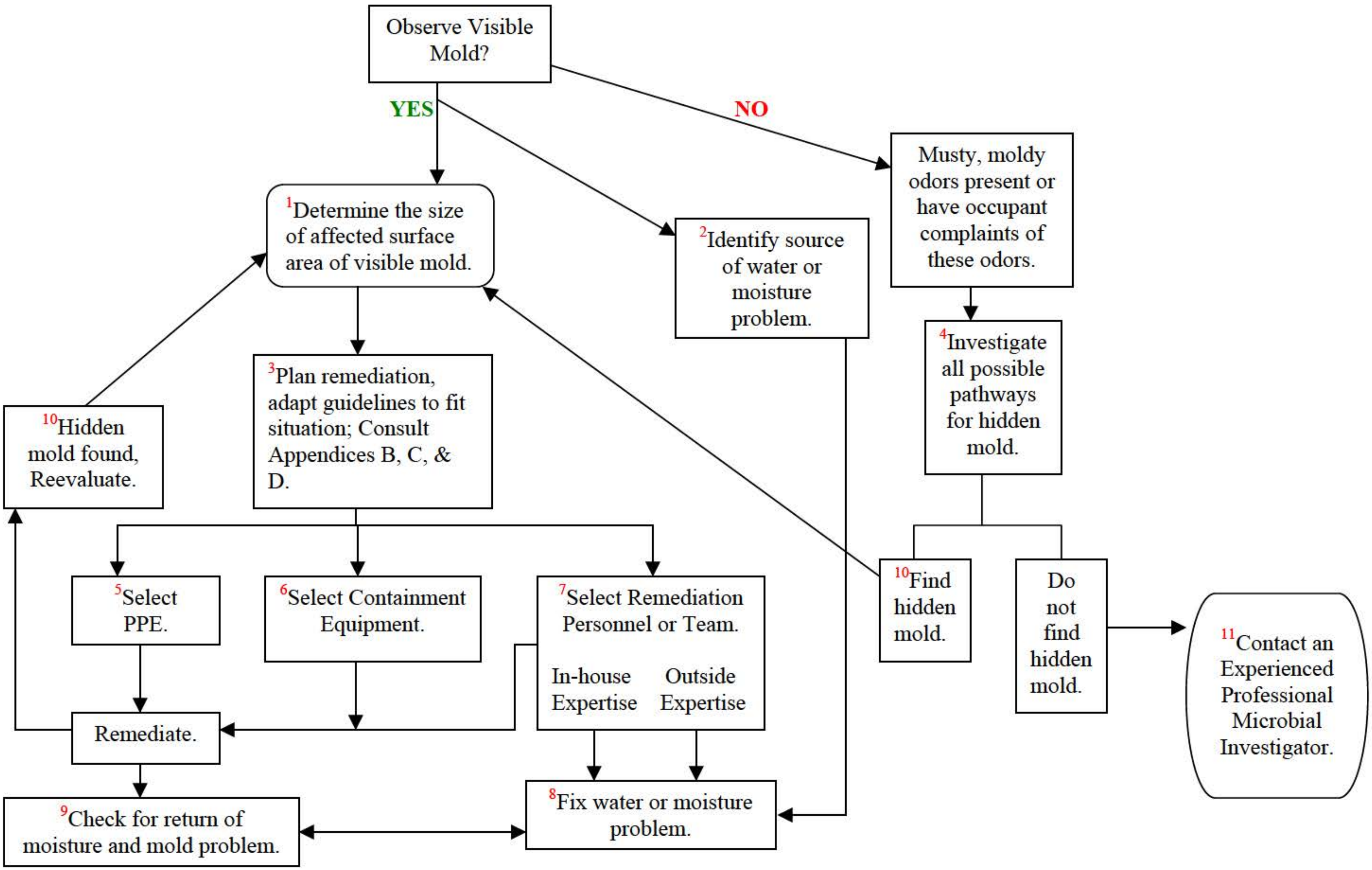
MOLD INVESTIGATION DECISION LOGIC



MOLD INVESTIGATION DECISION LOGIC NOTES:

1. Roughly approximate the total surface area of visible mold. Categorization of the remediation levels are sometimes borderline, so when trying to decide the category to apply, consider the extent of visible growth, such as a heavy blanket of growth on the surface, to barely visible. If heavy growth is apparent, consider moving up to the next level of protection.

2. Do not skip this step. Address the source of water or moisture problem or the mold will simply reappear.

3. Always protect the health and safety of the building occupants and remediators.

4. Mold may be hiding on the backside of drywall, vinyl wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads. Check walls behind furniture, pipe chases and utility tunnels, porous thermal or acoustic liners inside ductwork, or check the rafters (due to roof leaks or insufficient insulation)[3].

5. Utilize appendices B and C for remediation guidance. Use your best judgment during investigations, if not disturbing the mold you may need minimal to no PPE. Do not alarm building occupants unnecessarily, but protect yourself as necessary.

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities[3]. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

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APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

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Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft²)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 and 100 ft²			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft² or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

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Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

®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 (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

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minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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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
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Prepared by:

The EI Group, Inc.
2101 Gateway Centre Blvd.
Morrisville, North Carolina
27560

Report Date: December 30, 2008

Project ID: IHMO080101.03

Non-Responsive [redacted] ________

Manager, Charlotte Operations

Non-Responsive [redacted] ________

Senior Industrial Hygienist

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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. [redacted].

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).

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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 Wipe™ samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 µm MCE cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, MD for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix B.

No deteriorated paint was observed. No lead was detected in any sample collected.

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Lead Testing Results Summary

Location	Air ug/m³	Surface ug/ft²	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, CO_2 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 CO_2 recommended is 1,089 ppm (389 ppm + 700 ppm). The results of the testing met the ASHRAE guidelines.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
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**

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/m^3. The concentration observed outdoors was found to range from 7,020 to 8,250 spores/m^3. 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/m^3 while Room 113A was found to have an *Aspergillus/Penicillium* concentration of 1,640 spores/m^3.

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 direct-expansion (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

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scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and The EI Group, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

References

Title 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration.

Lead - (29 CFR 1910.1025(h))

American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2008 Edition

Industrial Ventilation: A Manual of Recommended Practice for Design, 25th Edition

Georgia Army National Guard: Standard Army Safety and Occupational Health Inspection Checklist; 1 October 1999 Edition

ANSI Z358.1 – 2004, Emergency Eye Wash and Shower Equipment

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62-1-2007.

RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

National Emission Standard Hazardous Air Pollutants (NESHAP) - The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

Environmental Protection Agency (EPA) standards (40 Code of Federal Regulations (CFR) 745.227(h)(3))

Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation

Appendix A

Photographs

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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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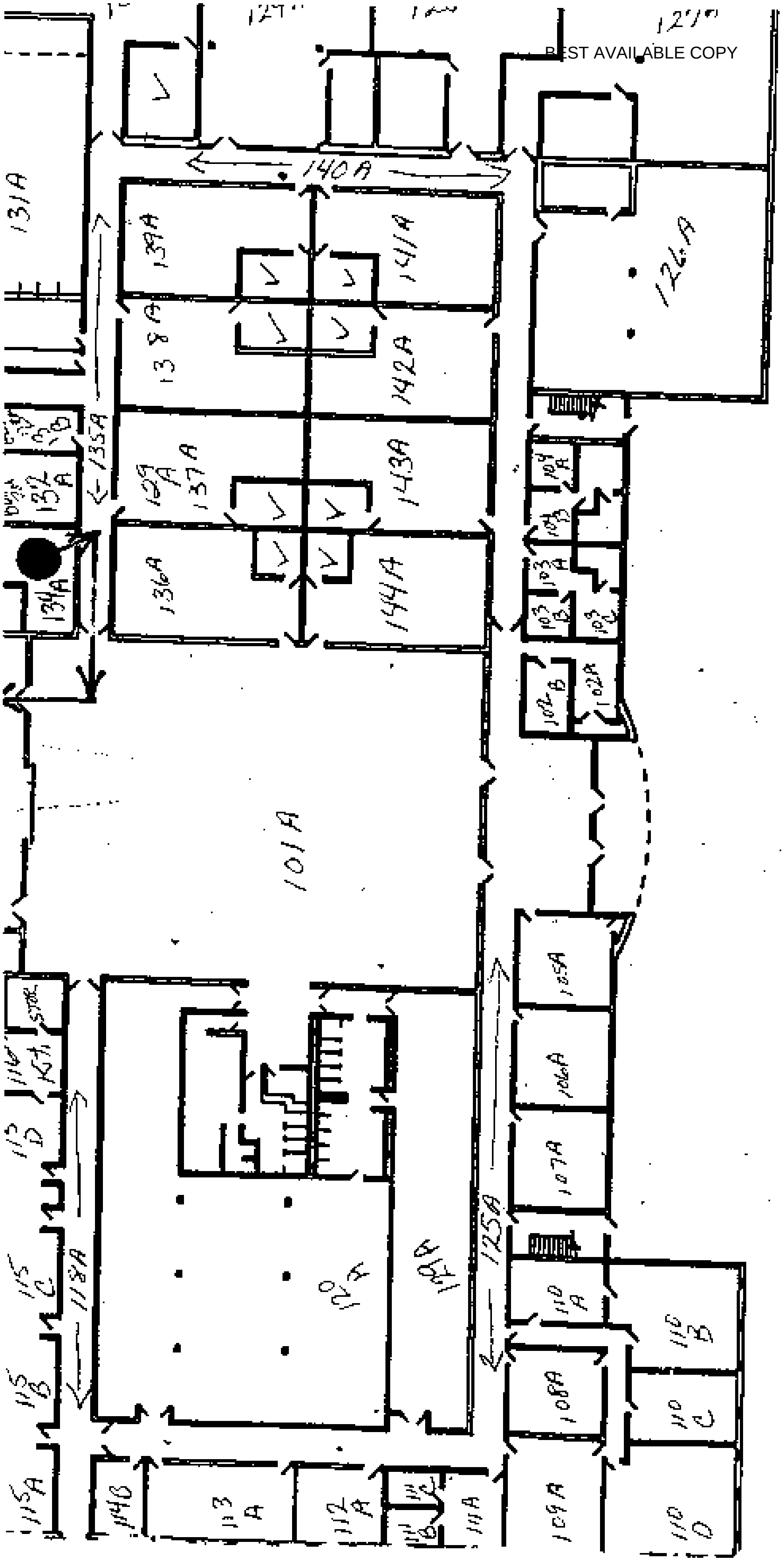

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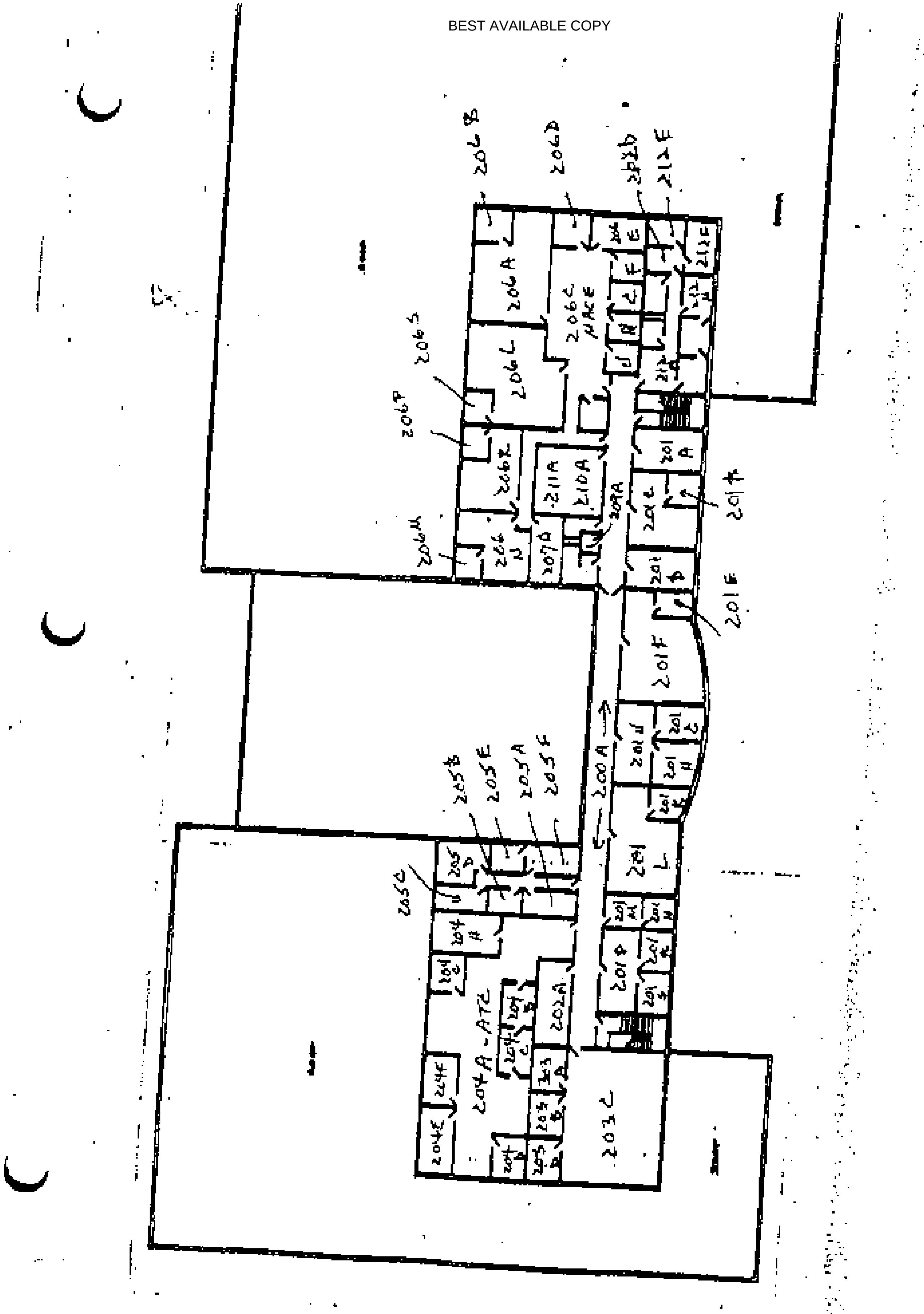

EDGEWOOD ARMORY
SECOND FLOOR PLAN
NO SCALE

Appendix B

Laboratory Analysis Report

AMA Analytical Services, Inc.

Invoice: **95246**

Client:	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:**	[redacted]

Attention: [redacted]

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AMA Sample #	Client Sample #	Analysis and Sample Type	Turn Around	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	NGA-02-A	AA Lead Air	5 Day +	$8.00				$8.00
0882219	NGA-03-A	AA Lead Air	5 Day +	$8.00				$8.00
0882220	NGA-01-W	AA Lead Wipe	5 Day +	$8.00				$8.00
0882221	NGA-02-W	AA Lead Wipe	5 Day +	$8.00				$8.00
0882222	NGA-03-W	AA Lead Wipe	5 Day +	$8.00				$8.00
0882223	NGA-04-W	AA Lead Wipe	5 Day +	$8.00				$8.00
0882224	NGA-05-W	AA Lead Wipe	5 Day +	$8.00				$8.00
0882225	NGA-06-W	AA Lead Wipe	5 Day +	$8.00				$8.00
0882226	NGA-07-W	AA Lead Wipe	5 Day +	$8.00				$8.00
0882227	OR	MLD Spore Trap	5 Day +	$30.00				$30.00
0882228	OF	MLD Spore Trap	5 Day +	$30.00				$30.00
0882229	113A	MLD Spore Trap	5 Day +	$30.00				$30.00
0882230	104D	MLD Spore Trap	5 Day +	$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.

Note: All Accounts over 30 days are subject to a 1½% per month service charge.

* Only apply if additional analysis was performed on the sample(s)

Account Code: NATLG

Remit to: P.O. Box 646, Hanover, Maryland 21076, 410-684-3327

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA Environmental Lead 100470

NY ELAP 10920

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:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	9/9/2008
				Report Date:	9/9/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Final Result			Comments
0882217	NGA-01-A	Flame	Air	920	N/A	3.26	ug/m³	<	3.3	ug/m³	
0882218	NGA-02-A	Flame	Air	916	N/A	3.28	ug/m³	<	3.3	ug/m³	
0882219	NGA-03-A	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	
0882220	NGA-01-W	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0882221	NGA-02-W	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0882222	NGA-03-W	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0882223	NGA-04-W	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0882224	NGA-05-W	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0882225	NGA-06-W	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0882226	NGA-07-W	Flame	Wipe Blank	****	N/A	12.00	ug	<	12	ug	

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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AIHA Environmental Lead 100470

NY ELAP 10920

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:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	9/9/2008 **Report Date:** 9/9/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Final Result	Comments

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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)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.
Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accrediation applies only to paint chip, wipe, and water samples.

Analyst: Melissa Sampson **Technical Manager:** G Edward Carney

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An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

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AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 16548

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date	9/9/2008

	Result		Percent Recovery	RPD	Comment
Preparation Blank	0 021	ppm			Acceptable
Report Limit Verification Sample	0 3886	ppm	116 6%		Acceptable
Expected Spike Level (ppm) 0 3333					
Duplicate Sample 1	#Num!	mg/Kg			
Duplicate Sample 2	#Num!	mg/Kg		#Error	#Error
Matrix Spike Analysis					
Spiked Sample			99.37%		Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample 1	293 671	µg	103.05%		Acceptable
Laboratory Control Sample 2	288.608	µg	103 42%	0 36%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0 99987

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
503164	81783	OLN-I W-01
503164	81784	OLN-I W-02

SDG Number: 16548

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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
503164	81785	OLN-LW-03
503164	81786	OLN-LW-04
503164	81787	OLN-LW-05
503164	81788	OLN-LW-06
503164	81789	OLN-LW-07
503164	81790	OLN-LW-08
503164	81791	OLN-LW-09
503164	81792	OLN-LW-10
503164	81793	OLN-LW-FB1
181402	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
181402	82226	NGA-07-W

SDG Number: 16548

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 16547

Analysis Type:	Flame
Sample Type:	Air
Analysis Date:	9/8/2008

		Result		Percent Recovery	RPD	Comment
Preparation Blank		-0.103	ppm			Acceptable
Report Limit Verification Sample		0.2194	ppm	87.8%		Acceptable
Expected Spike Level (ppm)	0.25					
Duplicate Sample 1		#Num!	mg/Kg			
Duplicate Sample 2		#Num!	mg/Kg		#Error	#Error
Matrix Spike Analysis						
Spiked Sample				106.15%		Acceptable
Spike Duplicate				104.70%	1.38%	Acceptable
Laboratory Control Sample 1		110.689	µg	105.18%		Acceptable
Laboratory Control Sample 2		113.155	µg	103.75%	1.36%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.99991

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
180767	82077	N0276-01
180767	82078	N0276-02

SDG Number: 16547

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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
180767	82079	N0276-03
181402	82217	NGA-01-A
181402	82218	NGA-02-A
181402	82219	NGA-03-A
181404	82232	487-1
181404	82233	487-2
181404	82234	487-3
181417	82245	492-2
181417	82246	492-1
181417	82247	492-3
503172	82261	9408LBP-1
503172	82262	9408LBP-2
503173	82263	9208LBP-1
503173	82264	9208LBP-2
503174	82265	9508LBP-1
503174	82266	9508LBP-2
503175	82267	9308LBP-1
503175	82268	9308LBP-2

SDG Number: 16547

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ACCREDITED LABORATORY AIHA Environmental Microbiology See aihaiqap.org for details

CERTIFICATE OF ANALYSIS

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 [redacted]
Attention:	Non-Responsive [redacted]	**P.O. Number:**	Not Provided	**Date Analyzed:**	9/9/2008
				Report Date:	9/9/2008

AMA Sample #	0882227	**AMA Sample #**	0882228
Client ID	OR	**Client ID**	OF
Analyst ID	RC	**Analyst ID**	RC
Collection Apparatus	Air-O-Cell	**Collection Apparatus**	Air-O-Cell
Sample Volume (L)	150	**Sample Volume (L)**	150
Analytical Sensitivity (sp/m³)	41	**Analytical Sensitivity (sp/m³)**	41
Sample Condition	Acceptable	**Sample Condition**	Acceptable

	Raw CT.	**%**		**sp/m³**		**Raw CT.**	**%**		**sp/m³**
Alternaria	Present		<	41	**Alternaria**	2	1.0%		82
Ascospores	14	8.2%		574	**Ascospores**	18	9.0%		738
Aureobasidium					**Aureobasidium**				
Basidiospores	105	61.4%		4,310	**Basidiospores**	103	51.2%		4,230
Bipolaris/Drechslera/Helm.					**Bipolaris/Drechslera/Helm.**				
Boletus					**Boletus**				
Botrytis					**Botrytis**				
Cercospora					**Cercospora**				
Chaetomium	Present		<	41	**Chaetomium**				
Cladosporium	13	7.6%		533	**Cladosporium**	25	12.4%		1,030
Coprinus					**Coprinus**				
Curvularia					**Curvularia**				
Epicoccum					**Epicoccum**	1	0.5%		41
Fusarium					**Fusarium**				
Ganoderma					**Ganoderma**				
Nigrospora					**Nigrospora**				
Penicillium / Aspergillus	12	7.0%		492	**Penicillium / Aspergillus**	22	10.9%		903
Pithomyces	Present		<	41	**Pithomyces**	1	0.5%		41
Rusts					**Rusts**				
Smuts/Periconia/Myxomycetes	2	1.2%		82	**Smuts/Periconia/Myxomycetes**	Present		<	41
Stachybotrys					**Stachybotrys**				
Stemphylium					**Stemphylium**				
Trichoderma					**Trichoderma**				
Torula					**Torula**	Present		<	41
Ulocladium					**Ulocladium**				
Zygomycetes					**Zygomycetes**				
Other Colorless	24	14.0%		985	**Other Colorless**	29	14.4%		1,190
Unknown					**Unknown**	Present		<	41
Hyphal Fragments*	Present		<	41	**Hyphal Fragments***	2			82
Zygophiala	1	0.6%		41					
Totals Spore Concentration				7,020	**Totals Spore Concentration**				8,250
Location					**Location**				
Comments					**Comments**				

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CERTIFICATE OF ANALYSIS

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:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	Not Provided	**Date Analyzed:**	9/9/2008
				Report Date:	9/9/2008

AMA Sample #	0882229
Client ID	113A
Analyst ID	RC
Collection Apparatus	Air-O-Cell
Sample Volume (L)	150
Analytical Sensitivity (sp/m³)	27
Sample Condition	Acceptable

	Raw CT.	%		sp/m³
Alternaria	1	0.4%		27
Ascospores	23	10.3%		629
Aureobasidium				
Basidiospores	90	40.2%		2,460
Bipolaris/Drechslera/Helm.				
Boletus				
Botrytis				
Cercospora				
Chaetomium				
Cladosporium	31	13.8%		848
Coprinus				
Curvularia	1	0.4%		27
Epicoccum	Present		<	27
Fusarium				
Ganoderma				
Nigrospora	Present		<	27
Penicillium / Aspergillus	60	26.8%		1,640
Pithomyces	Present		<	27
Rusts				
Smuts/Periconia/Myxomycetes	1	0.4%		27
Stachybotrys				
Stemphylium				
Trichoderma				
Torula				
Ulocladium				
Zygomycetes				
Other Colorless	17	7.6%		465
Unknown	Present		<	27
Hyphal Fragments*	1			27
Totals Spore Concentration				6,130
Location				
Comments				

AMA Sample #	0882230
Client ID	104D
Analyst ID	RC
Collection Apparatus	Air-O-Cell
Sample Volume (L)	150
Analytical Sensitivity (sp/m³)	27
Sample Condition	Acceptable

	Raw CT.	%		sp/m³
Alternaria	Present		<	27
Ascospores	10	10.1%		274
Aureobasidium				
Basidiospores	44	44.4%		1,200
Bipolaris/Drechslera/Helm.				
Boletus				
Botrytis				
Cercospora				
Chaetomium				
Cladosporium	6	6.1%		164
Coprinus				
Curvularia	Present		<	27
Epicoccum	3	3.0%		82
Fusarium				
Ganoderma				
Nigrospora				
Penicillium / Aspergillus	22	22.2%		602
Pithomyces				
Rusts				
Smuts/Periconia/Myxomycetes	1	1.0%		27
Stachybotrys				
Stemphylium				
Trichoderma				
Torula				
Ulocladium				
Zygomycetes				
Other Colorless	13	13.1%		356
Unknown				
Hyphal Fragments*	Present		<	27
Totals Spore Concentration				2,710
Location				
Comments				

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CERTIFICATE OF ANALYSIS

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:**	[redacted]
Attention:	[redacted]	**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/m³)	27
Sample Condition	Acceptable

	Raw CT.	%	sp/m³
Alternaria			
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			
Ganoderma			
Nigrospora			
Penicillium / Aspergillus	8	66.7%	219
Pithomyces			
Rusts			
Smuts/Periconia/Myxomycetes			
Stachybotrys			
Stemphylium			
Trichoderma			
Torula			
Ulocladium			
Zygomycetes			
Other Colorless			
Unknown			
Hyphal Fragments*	1		27
Totals Spore Concentration			328
Location			
Comments			

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CERTIFICATE OF ANALYSIS

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:**	[redacted]
Attention:	[redacted]	**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 media.

Unacceptable: 1. The sample is overloaded with material. 2. The sample trace has been disturbed. 3. The sample was not collected properly.

Obscured: The loading on the sample is high, possibly obscuring spores present. The quantity reported should be considered the minimum concentration present. The actual concentration may be higher than the reported concentration.

Spore Notes: Based on their small size and very few distinguishing characteristics, Aspergillus and Penicillium cannot be differentiated by non-viable sampling methods. There are other types of spores whose morphology is similar to Aspergillus and Penicillium and cannot be differentiated by non-viable sampling methods. Examples of these similar spores are Acremonium, Paecilomyces, Wallemia, and Trichoderma.

Smut, Periconia and Myxomycetes are three different types of organisms that have similar morphological characteristics.

Bipolaris/Dreschlera/Helm: Bipolaris / Dreschlera / Helminthosporium group.

Other Colorless represents all colorless spores that are non-distinctive and unidentifiable.

* Hyphal Fragments: A portion of the mycelium that becomes separated from the remainder of the thallus (vegetative body), each of which has the capacity to grow and form new individuals. Results for hyphal fragments are in fragments/m^3 and are not incorporated in the total spore concentration.

Quantification: Analytical Sensitivity (A.S.): This is dependent on the volume of air collected and the amount of the trace that was analyzed.

The value of "Present" indicated in the Raw Count column represents the presence of this spore type during the preliminary exam at 400x. The Raw Count converts to a whole number if the spore type is encountered again during the 1,000x enumeration. The sp/m^3concentration will be reported as less than the analytical sensitivity if "Present" is reported in the Raw Count.

Due to rounding, totals may not equal 100%

sp/m^3: Spores per cubic meter.

Results are reported to 3 significant figures.

Rolenda Chuyate

Analyst Rolenda Chuyate

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.

EI

SAMPLE CHAIN OF CUSTODY

Edgewood, MD

DATE SHIPPED	# OF SAMPLES	SAMPLE MEDIA TYPE	PROJECT NAME
	15		#181402 AMA

CONTACT	TELEPHONE NUMBER
Non-Responsive [redacted]	336 455 2558

SAMPLE # OR AREA	SAMPLE DATE	SAMPLE VOLUME	ANALYSIS REQUESTED
NGA - 01 - A	8/21/08	920 L	Lead: Air
NGA - 02 - A		916 L	
NGA - 03 - A		0	
OR		150 L	Fungal Spore: Air
OF			
1134			
1041D			
206C			
NGA-01-W		100 cm^2	Lead: Surface Wipe
NGA-02-W			
NGA-03-W			
NGA-04-W			
NGA-05-W			
NGA-06-W			
NGA-07-W		Blank	

	Signature	Date
Samples Relinquished By:	[signature]	8/22/08
Samples Received By:		
Samples Analyzed By:		

AMA Analytical Services, Inc.
Focused on Results
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquiries) 181402

Mailing/Billing Information:
1. Client Name: National Guard Bureau NE
2. Address 1: 301-1H Old Bay Lane
3. Address 2: Havre de Grace, MD 21078
4. Address 3:
5. Phone #: 336 455 2558 Fax #: 704 593 1650

Submittal Information:
1. Job Name: RC #494 Edgewood, Maryland
2. Job Location:
3. Job #: P.O. #:
4. Contact Person: [redacted] @ phone #: 336 455 2558
5. Submitted by: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day
☐ 2 Day Date Due: 9/11/08
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☐ Include COC/Field Data Sheets with Report
☒ Email [redacted] @ ei1.com
☐ Fax:
☐ Verbals:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ NIOSH 7400____(QTY)
☐ Fiberglass____(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ AHERA____(QTY)
☐ NIOSH 7402____(QTY)
☐ Other (specify____)____(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate____(QTY)
☐ EPA Point Count____(QTY)
☐ NY State Friable 198.1____(QTY)
☐ Grav. Reduction ELAP 198.6____(QTY)
☐ Other (specify____)____(QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield____(QTY)
☐ NY State PLM/TEM____(QTY)
☐ Residual Ash____(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust____(QTY)
☐ Quan. (s/area) Vacuum D5755-95____(QTY)
☐ Quan. (s/area)Dust D6480-99____(QTY)
TEM Water
☐ Qual. (pres/abs)____(QTY)
☐ ELAP 198.2/EPA 100.2____(QTY)
☐ EPA 100.1____(QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____°C)

Lead Analysis
☐ Paint Chip____(QTY)
☒ Dust Wipe (wipe type____) 7 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid____(QTY)
☐ TCLP____(QTY)
☐ Drinking Water____(QTY)
☐ Waste Water____(QTY)
☐ Dust Wipe Furnace (wipe type____)____(QTY)

Mold - Direct Microscopic Analysis
☐ Collection Apparatus for Spore Traps:____
☒ Spore-Trap 5 (QTY) ☐ Bulk____(QTY)
☐ Surface Swab____(QTY) ☐ Surface Vacuum Dust____(QTY)
☐ Surface Tape____(QTY) ☐ Other (Specify____)____(QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WALBK AND OTHER	SPORE TRAP	TAPE	SWAB
	See Attached															

ANALYSIS / MATRIX

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 9/4/08 @ 1100 Via: UPS By (Print): V. Sampson Sign: [illegible]
2. Date/Time Analyzed: 9/9/08 @ ____ By (Print): Rolenda Chuyate Sign: Rolenda Chuyate
3. Results Reported To: Vinco Maisto Via: Email Date: 9/9/08 Time: ____ Initials: ____
4. Comments:

ANALYTICAL LABORATORY SERVICES, INC.

Environmental ✦ Industrial Hygiene ✦ Field Services

www.analyticallab.com

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 [redacted]

Director, Environmental Health & Safety

3544 North Progress Avenue ✦ Suite 100 ✦ Harrisburg, PA 17110
TEL: 717-540-3424 ✦ FAX: 717-540-3428

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Section 1.0
Executive Summary

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Section 1.0 Executive Summary

On July 30, 2010, Analytical Laboratory Services, Inc. (ALSI) personnel Non-Responsive [redacted] Non-Responsive [redacted] 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/ft^2 in the attached garage on the floor by the TIG welder. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2.

2. 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

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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 ceilings 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.

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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

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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.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2	Paint Chip %Pb
1	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	
6	Drill Hall – Heater on Wall		<110	
7	Drill Hall – Floor		<110	
8	Drill Hall – Top of Table		<110	
9	Converted Firing Range Room 131A – Floor		<110	
10	Converted Firing Range Room 131A – Front of TV		<110	
11	Floor Outside Converted Firing Range Room 131A		<110	
12	Room 141A – Top of TV		<110	
13	Room 104D – Top of Microwave		<110	
14	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	

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Sample #	Location	Air ug/m³	Surface ug/ft²	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/ft^2 in the attached garage on the floor by the TIG welder.

The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for Environmental Chemicals," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 ug/m^3. In fact, no detectable level of lead was identified in the air samples collected.

Housekeeping and cleaning activities should be improved to maintain surface lead dust concentrations below 200 ug/ft^2.

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Section 5.0
Lighting

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Section 5.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. K070003). The light meter was last calibrated on November 26, 2009. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
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	No
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

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

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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 68.6 to 82.6 degrees F with relative humidity readings ranging from 43.2% to 61.7%. During the survey, carbon dioxide (CO_2) levels ranged from 437 ppm to 680 ppm within the facility compared to an outdoor CO_2 level of 389 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,089 ppm (389 ppm + 700 ppm). The following table summarizes the measurements collected.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	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 110D	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 201F	72.1	53.3	669	0.0
Room 201L	70.3	53.3	647	0.0
Room 204A	70.6	55.5	661	0.0

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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 air-handlers. 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.

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Section 7.0
Suspect Asbestos Containing Building Materials

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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.

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Section 8.0
Maintenance Bay

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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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Section 9.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Analytical Laboratory Services, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A
Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY
LAB #100470
NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Edgewood Armory	**Chain Of Custody:**	598496
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	APG MD	**Date Submitted:**	8/5/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Edgewood Armory	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	8/11/2010 **Report Date:** 8/11/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

Page 1 of 3

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
1067613	1007487-1	Flame	Air	693	N/A	4.3	ug/m³	<3	<4.3	ug/m³	
1067614	1007487-2	Flame	Air	616	N/A	4.9	ug/m³	<3	<4.9	ug/m³	
1067615	1007487-3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1067616	1007487-4	Flame	Wipe	****	0.108	110	ug/ft²	40	370	ug/ft²	
1067617	1007487-5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067618	1007487-6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067619	1007487-7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067620	1007487-8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067621	1007487-9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067622	1007487-10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067623	1007487-11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067624	1007487-12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067625	1007487-13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067626	1007487-14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067627	1007487-15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067628	1007487-16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067629	1007487-17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067630	1007487-18	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067631	1007487-19	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AIHA, NVLAP, NIST, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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A Specialized Environmental Laboratory

AIHA LAP, LLC ACCREDITED LABORATORY
LAB #100470
NY ELAP 10920

CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	Job Name:	Edgewood Armory	Chain Of Custody:	508496
Address:	301-JH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	APG MD	Date Submitted:	8/5/2010
	Havre de Grace, Maryland 21078	Job Number:	Edgewood Armory	Person Submitting:	[redacted]
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	8/11/2010 Report Date: 8/11/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
1067632	1007487-20	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067633	1007487-21	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067634	1007487-22	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067635	1007487-23	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067636	1007487-24	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067637	1007487-25	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067638	1007487-26	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1067639	1007487-27	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	

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An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

LAB #100470

NY ELAP 10920

Client:	National Guard Bureau	Job Name:	Edgewood Armory	Chain Of Custody:	508496
Address:	301-III Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	APG MD	Date Submitted:	8/5/2010
	Havre de Grace, Maryland 21078	Job Number:	Edgewood Armory	Person Submitting:	[redacted]
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	8/11/2010 Report Date: 8/11/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

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AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Total ug	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)
%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accreditation applies only to paint chip, wipe, and soil samples.

Analyst: N. McGarvey / L. Butruk Technical Manager: G Edward Carney

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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **508496**

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SL State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Edgewood Armory
2. Job Location: APG, MD
3. Job #: Edgewood Armory P.O. #: W912K6-09-A-0003
4. Contact Pers[redacted] @[redacted]
5. Submitted by [redacted] Signature [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day + Date Due: 8/12/10 ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ Include COC/Field Data Sheets with Report ☒ Email: [redacted] @analyticallab.com [redacted]@us.army.mil ☐ Fax: [redacted]@us.army.mil ☐ Verbals: [redacted]

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM ___(Qual) PLM ___(Qual) PLM/TEM ___(Qual) PLM/TEM ___(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area) Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C):

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☒ Pb Dust Wipe (wipe type ghost) 24 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER	SOIL	SPORE TRAP	TAPE	SWAB
1007487-1	Drill Hall RmIOA	7/30	693					X		X							
1007487-2	Rm 202C		1110					X		X							
1007487-3	Blank		0					X		X							
1007487-4	Attached Garage-Fl			100cm²				X				X					
1007487-5	Attached Garage-Desk							X				X					
1007487-6	Drill Hall-Heater							X				X					
1007487-7	Drill Hall-Fl							X				X					
1007487-8	Drill Hall-Table							X				X					
1007487-9	Rm B1A-Fl							X				X					
1007487-10	Rm B1A-TV							X				X					
1007487-11	Fl Outside Rm B1A							X				X					
1007487-12	Rm 141A-TV							X				X					

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 8 / 5 / 10 @ 915 Via: UPS By (Print): Nicole Maxwell Sign:
2. Date/Time Analyzed: ___ / ___ / ___ @ ___ By (Print) ___ Sign: ___
3. Results Reported To: ___ Via: ___ Date: ___ / ___ / ___ Time: ___ Initials: ___
4. Comments: ___

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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Edgwood Armory
2. Job Location:
3. Job #: [redacted] P.O. #: W912K6-09-A-0003
4. Contact Person: [redacted] @ phone #: (410) 942-0273
5. Submitted by: Signature:

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☐ 5 Day + Date Due: ☐ Results Required By Noon (Every Attempt Will Be Made to Accommodate)	☒ Include COC/Field Data Sheets with Report ☒ Email: [redacted]@us.army.mil ☐ Fax: ☐ Verbal: @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM __(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area) Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☐ Pb Dust Wipe (wipe type ____) ____ (QTY)
☐ Pb Air ____ (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media:
☐ Spore Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER	SPORE TRAP	TAPE	SWAB
1007487-13	Rm 104D-Microwave	7/30		100cm²				X				X				
1007487-14	Main Lobby-Fl							X				X				
1007487-15	Rm 105A Supply							X				X				
1007487-16	Rm 105A Cabinet							X				X				
1007487-17	Rm 110A Desk							X				X				
1007487-18	Rm 109A DeskShelf							X				X				
1007487-19	Fl Outside Rm 113A							X				X				
1007487-20	Rm 115B Bookshelf							X				X				
1007487-21	Rm 202C Supply							X				X				
1007487-22	Rm 206E Desk							X				X				
1007487-23	Rm 201F DeskShelf							X				X				
1007487-24	Rm 204A Win. Sill							X				X				

CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: / / @ Via: By (Print): Sign:
2. Date/Time Analyzed: / / @ By (Print): Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

Mailing/Billing Information:

1. Client Name: National Guard Bureau
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3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:

1. Job Name: Edgewood Armory
2. Job Location:
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Pers[redacted] @ phone # (410) 942-0273
5. Submitted by: Signature:

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☐ 5 Day +
☐ 2 Day Date Due:
☐ Results Required By Noon (Every Attempt Will Be Made to Accommodate)

REPORT TO:
☑ Include COC/Field Data Sheets with Report
☑ Email [redacted] @
☐ Fax: @us.army.mil
☐ Verba @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM ___ (Qual) PLM ___ (Quan) PLM/TEM ___ (Qual) PLM/TEM ___ (Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (V/area) Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☐ Pb Dust Wipe (wipe type ____) ____ (QTY)
☐ Pb Air ____ (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER	SPORE TRAP	TAPE	SWAB
1007487-25	F1 Outside Rail	7/30		100cm²				X				X				
1007487-26	Rm 302P Heater	↓		100cm²				X				X				
1007487-27	Blank	↓		0				X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY: (CUSTODY)

1. Date/Time RCVD: / / @ Via: By (Print): Sign:
2. Date/Time Analyzed: / / @ By (Print): Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

Appendix B
Photographs

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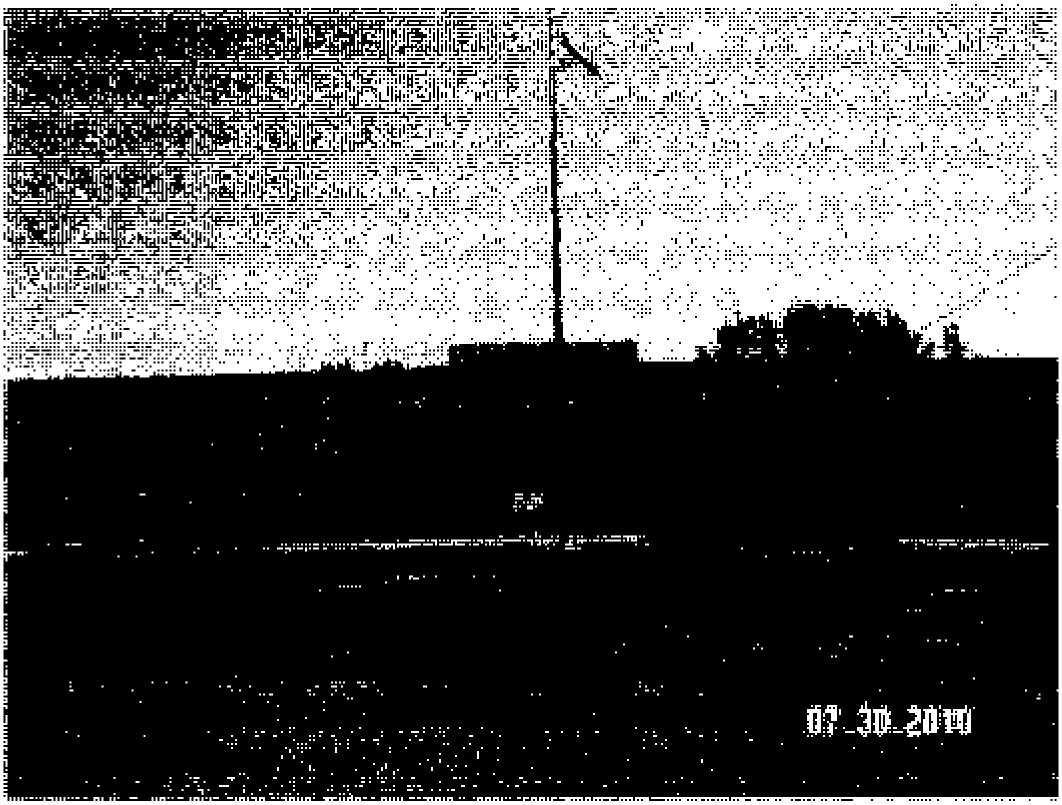


Photo 1: Exterior view, front.

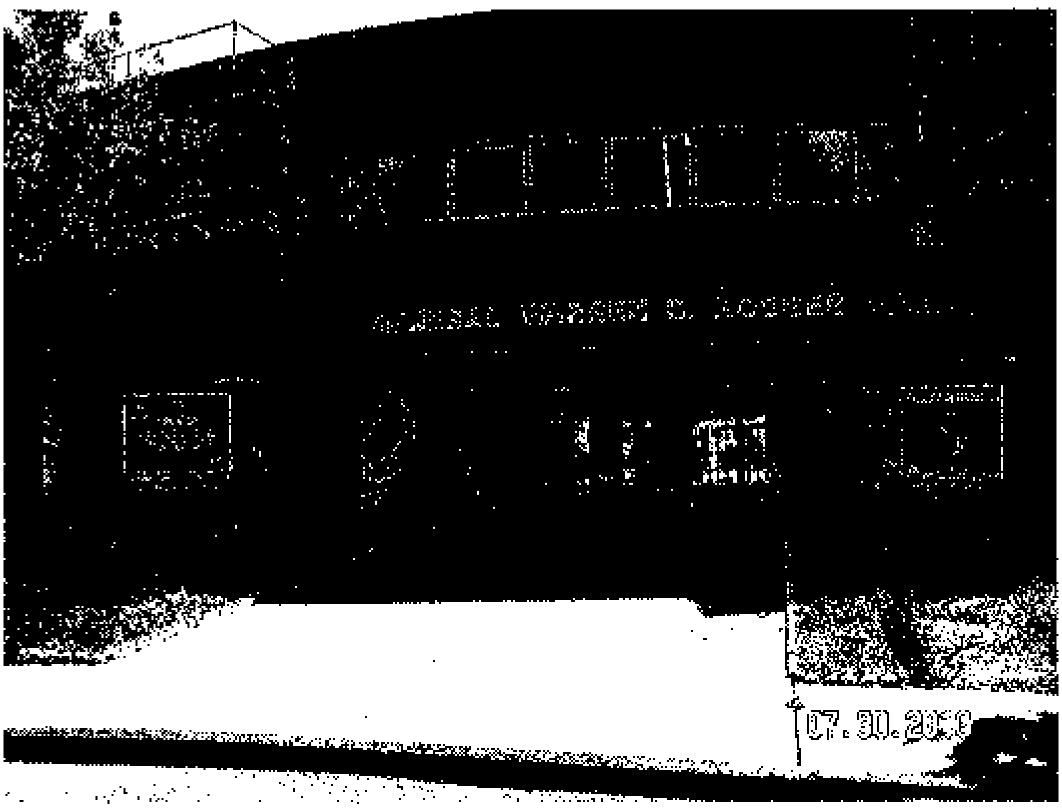


Photo 2: Exterior view, front.

Photo 3: Attached garage; vehicle maintenance.

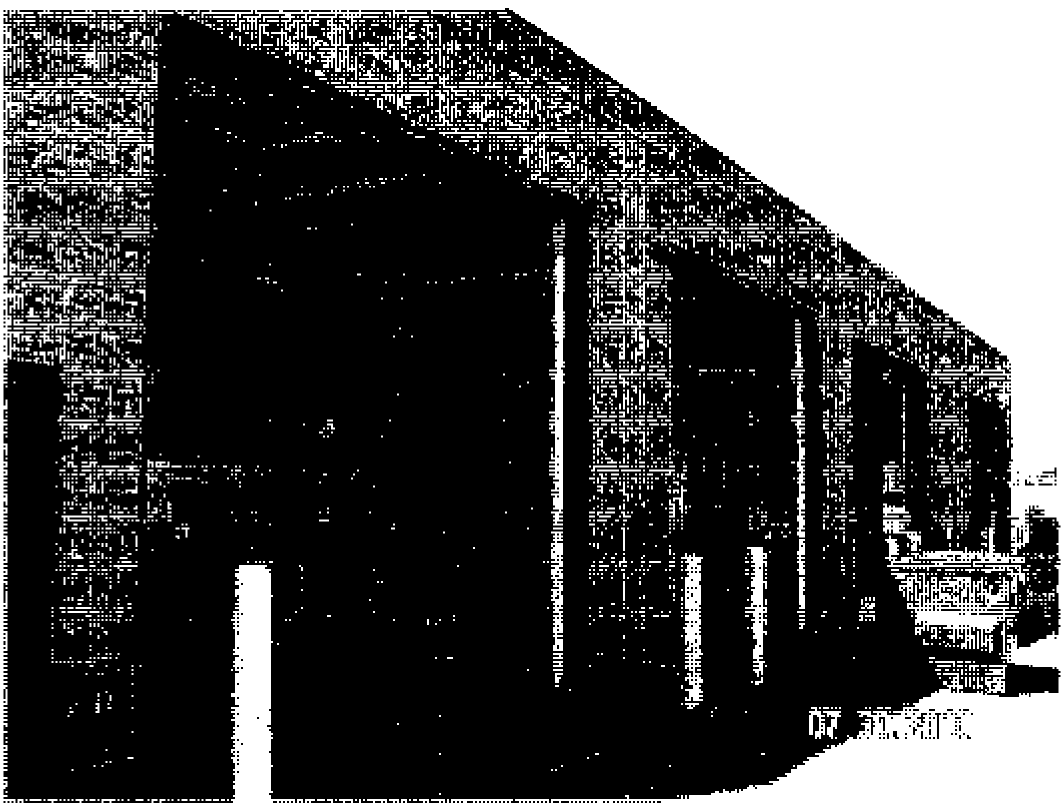


Photo 4: Attached garage; vehicle maintenance.

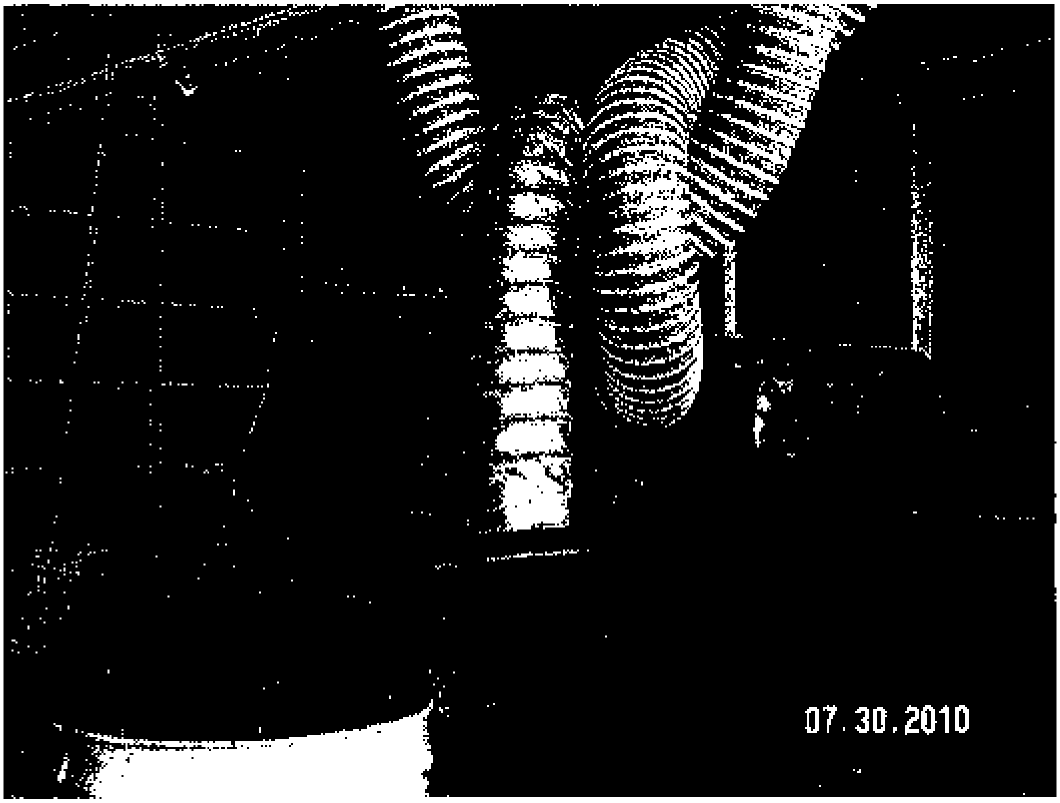
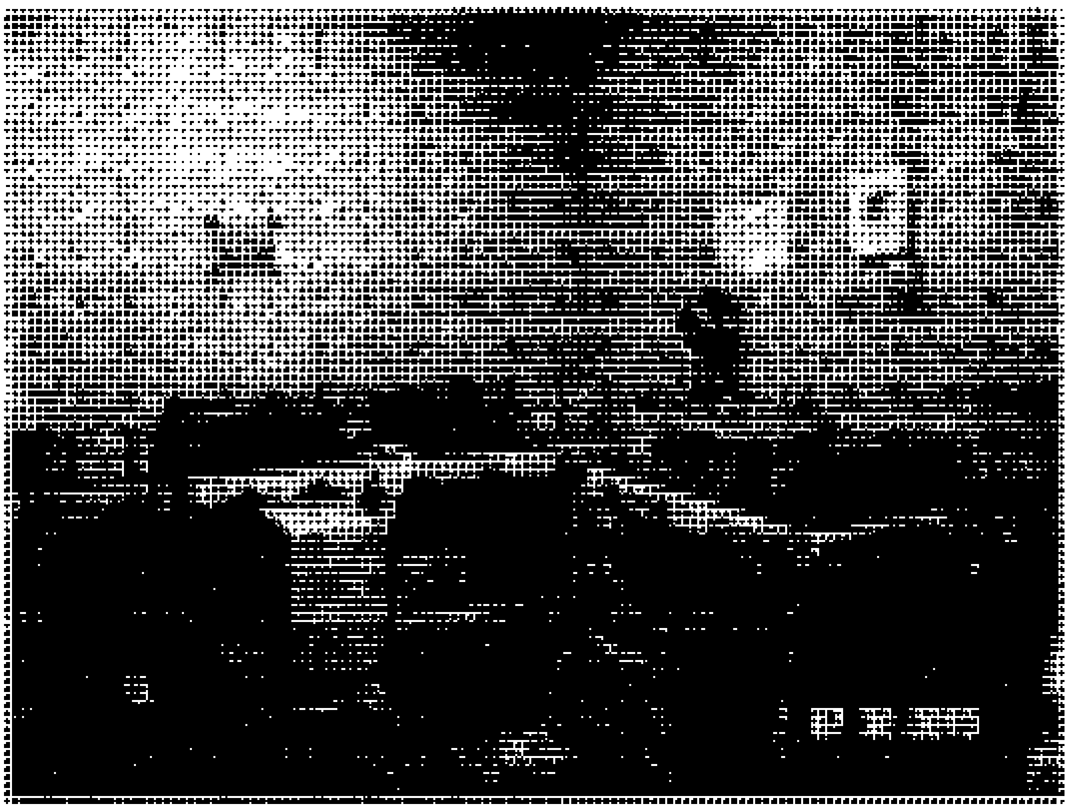


Photo 5: Exhaust ductwork in attached garage.



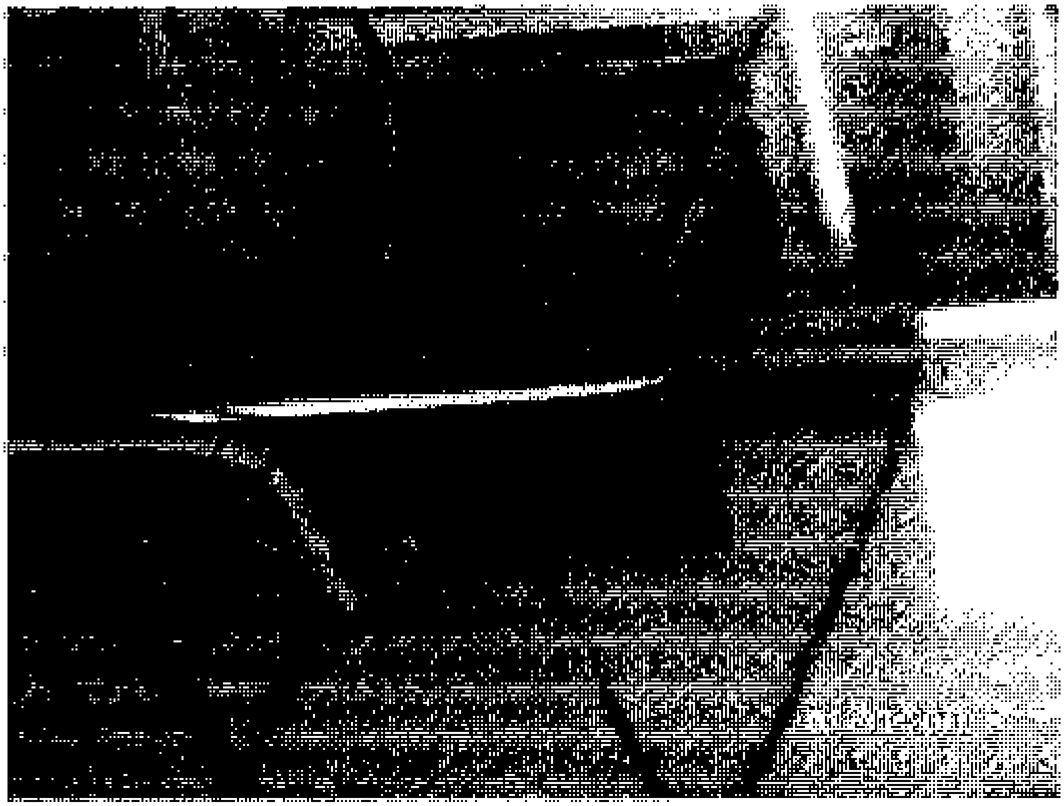


Photo 7: Exhaust fan in battery storage area.

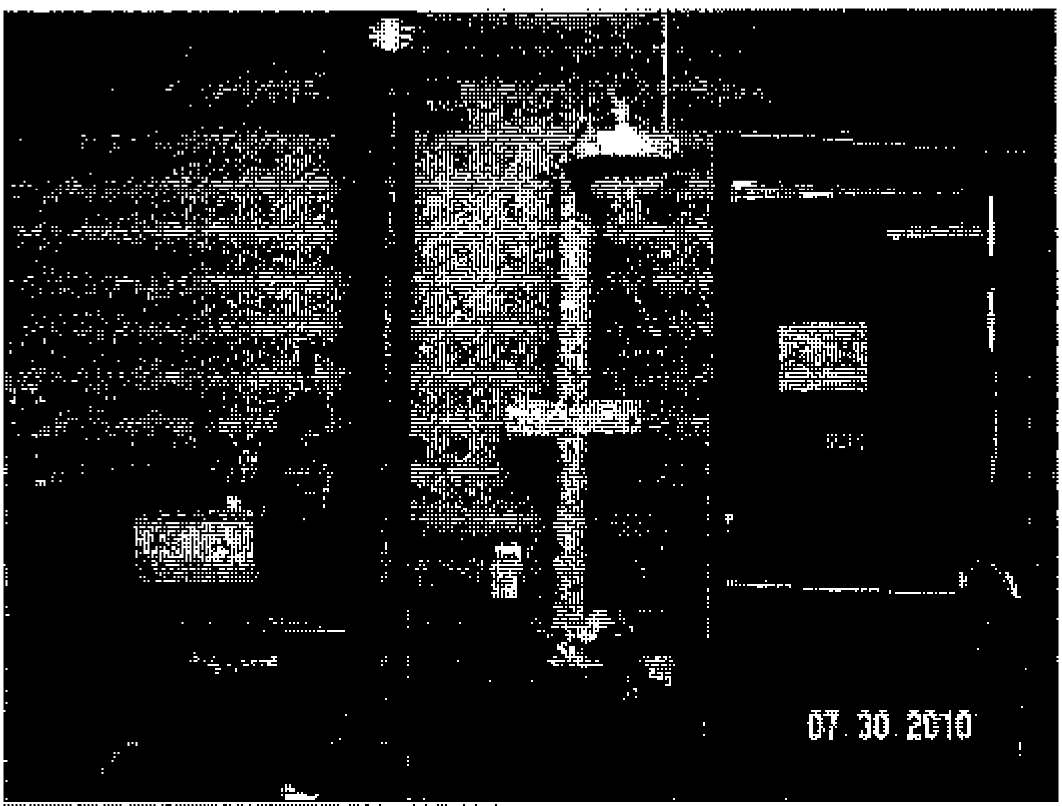


Photo 8: Emergency eye wash and shower in battery storage area.

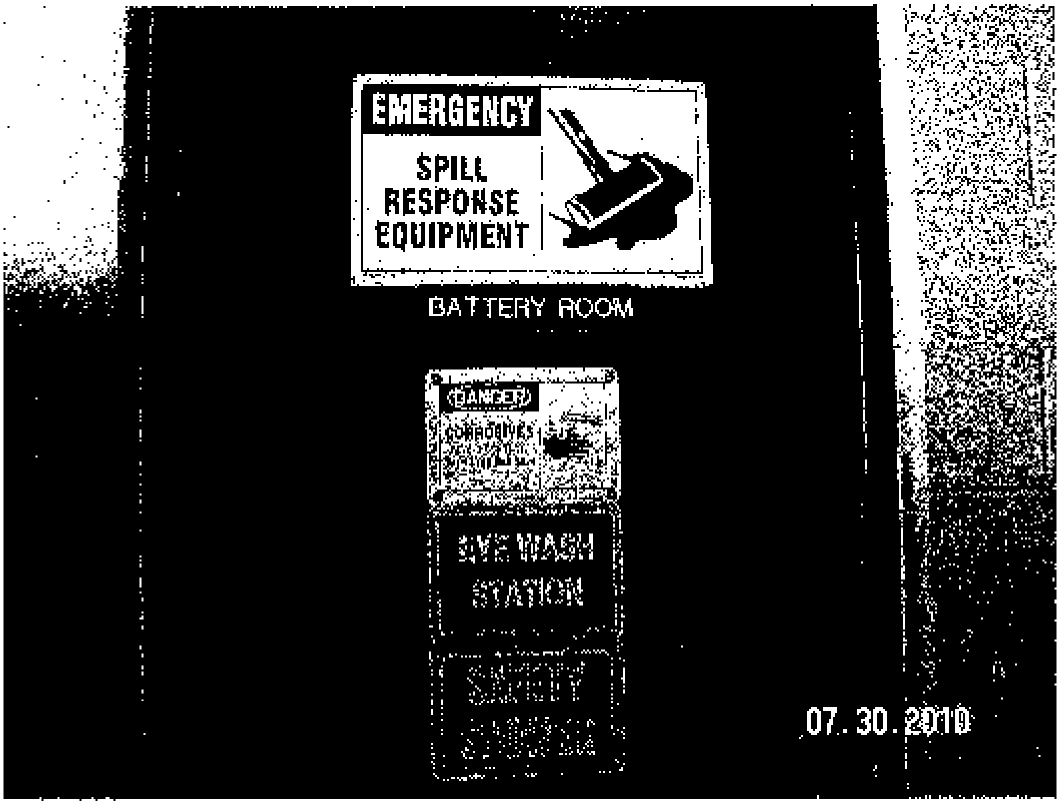


Photo 9: Battery room door.

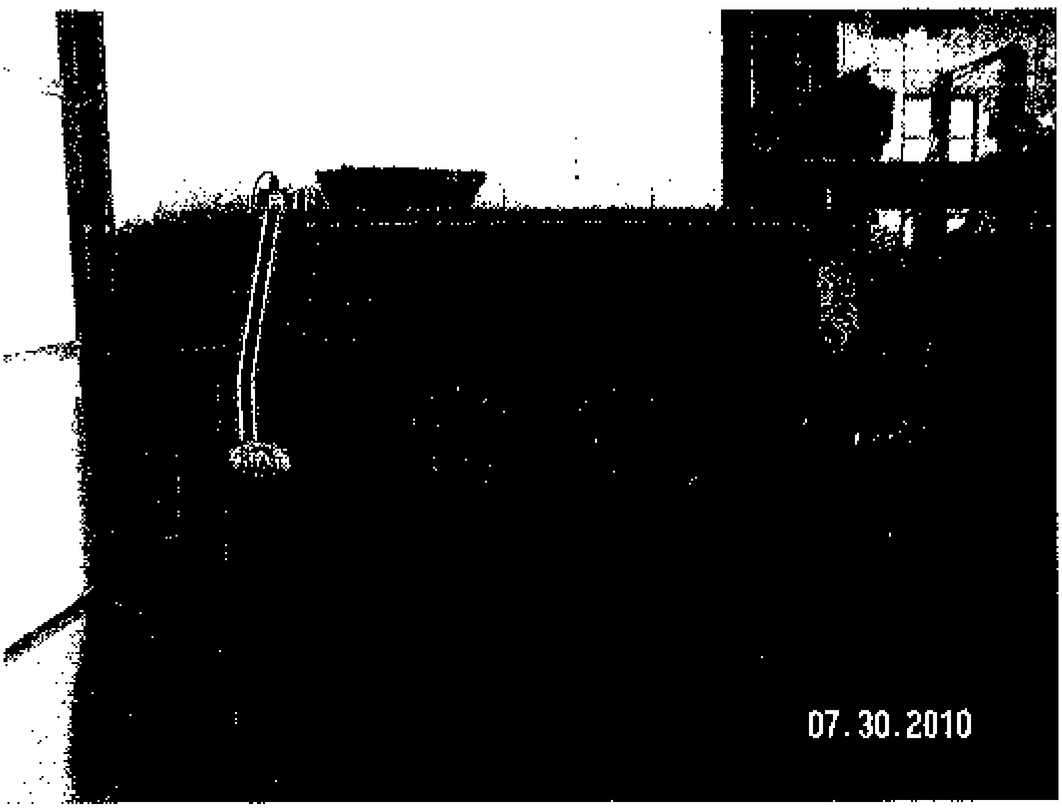


Photo 10: Dry Blast Machine, in attached garage.

Photo 11: Eye wash station in maintenance bay, in attached garage.

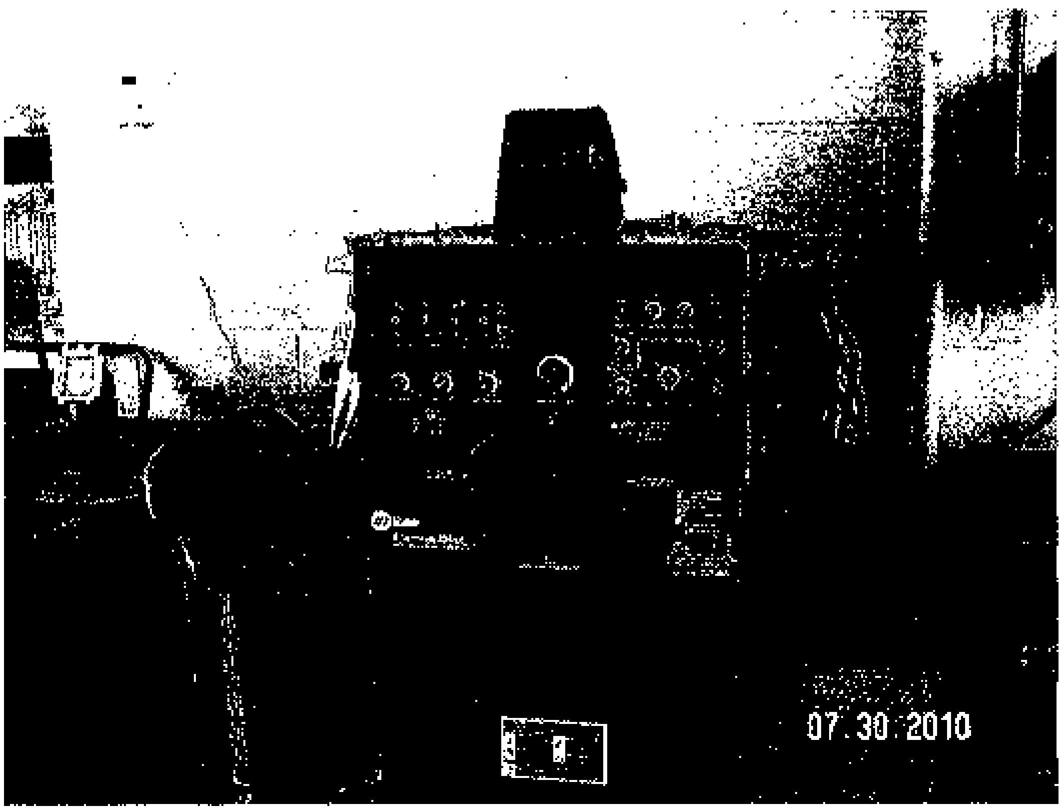


Photo 12: TIG Welder, in attached garage.

Photo 13: MIG Welder, in attached garage

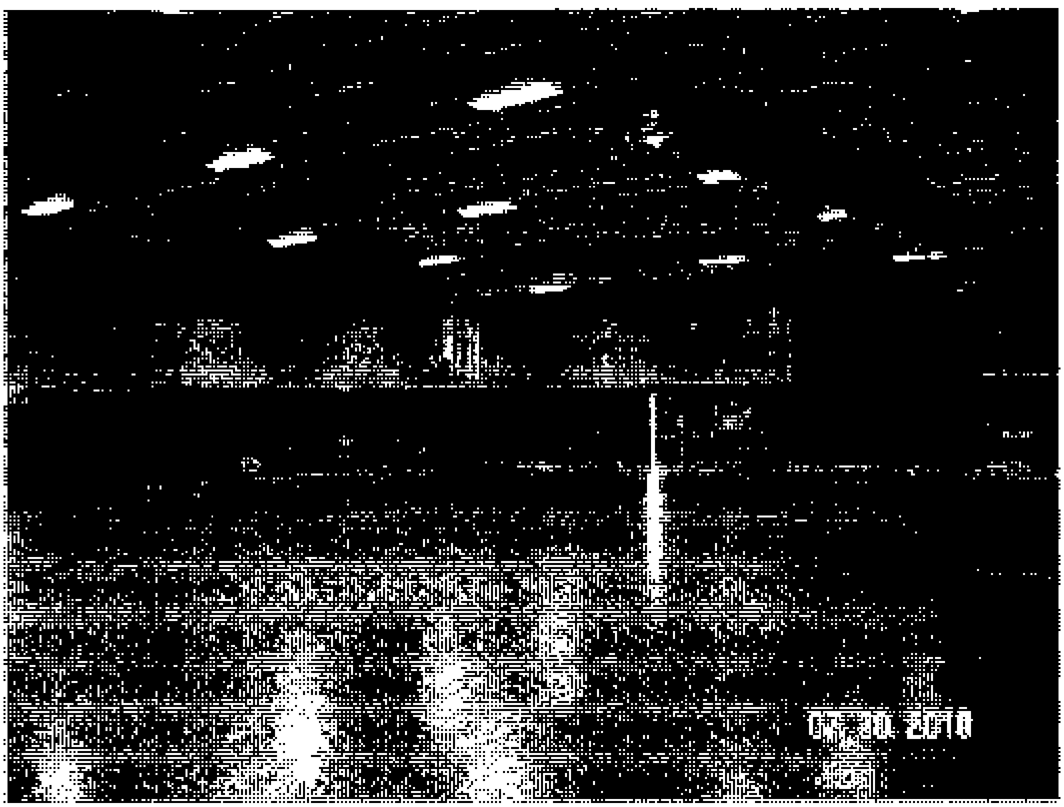


Photo 14: Drill Hall.

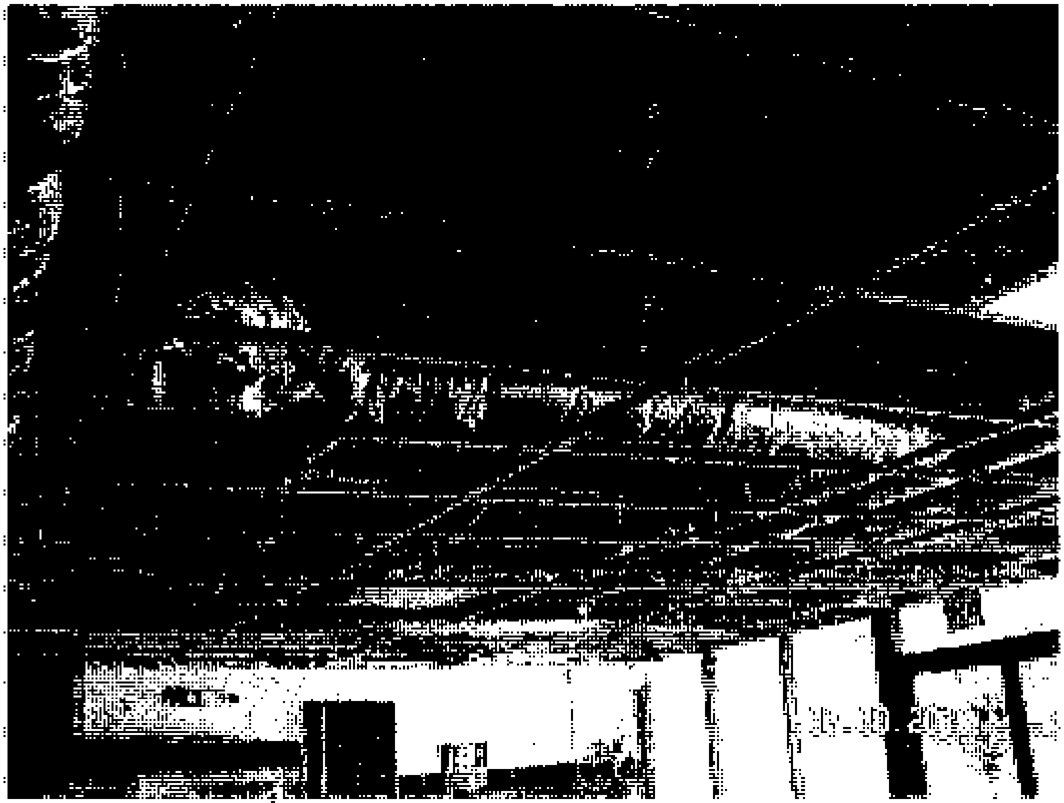


Photo 15: Ceiling, 1st floor hallway; representative of ceiling throughout building.

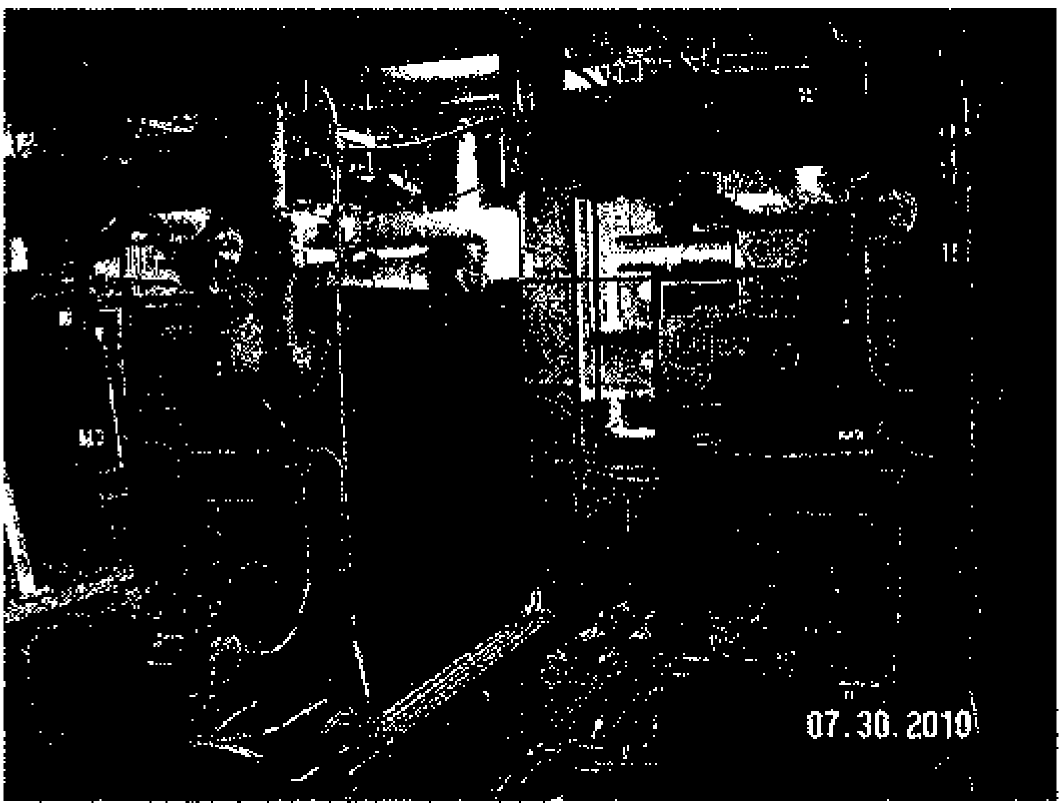


Photo 16: Boilers.

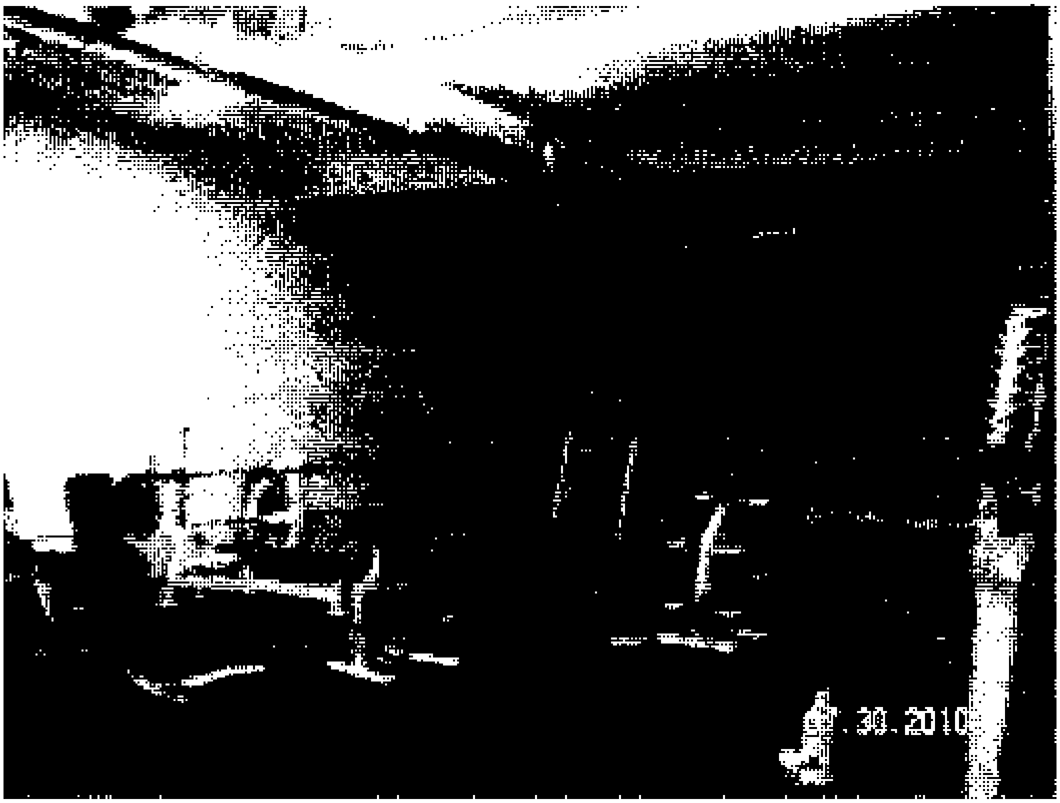


Photo 17: Converted Firing range.

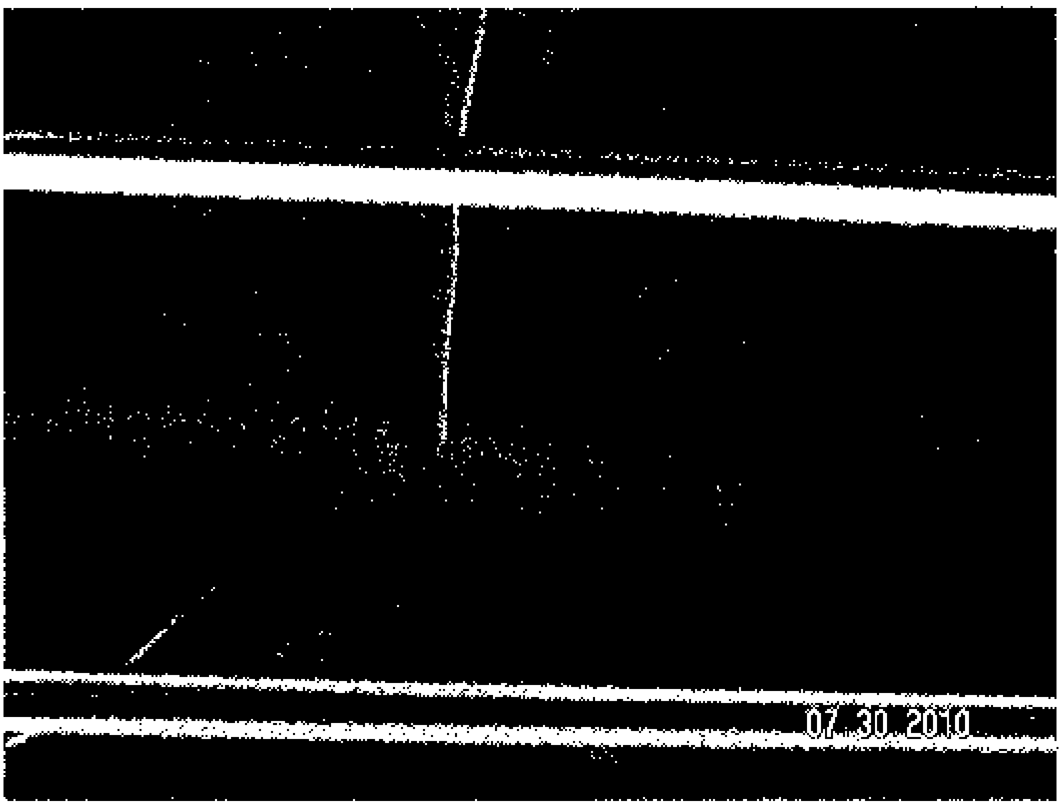


Photo 18: Hallway outside room 141A, spray-on insulation on metal beam, possible ACM.

Appendix C
Floor Plans

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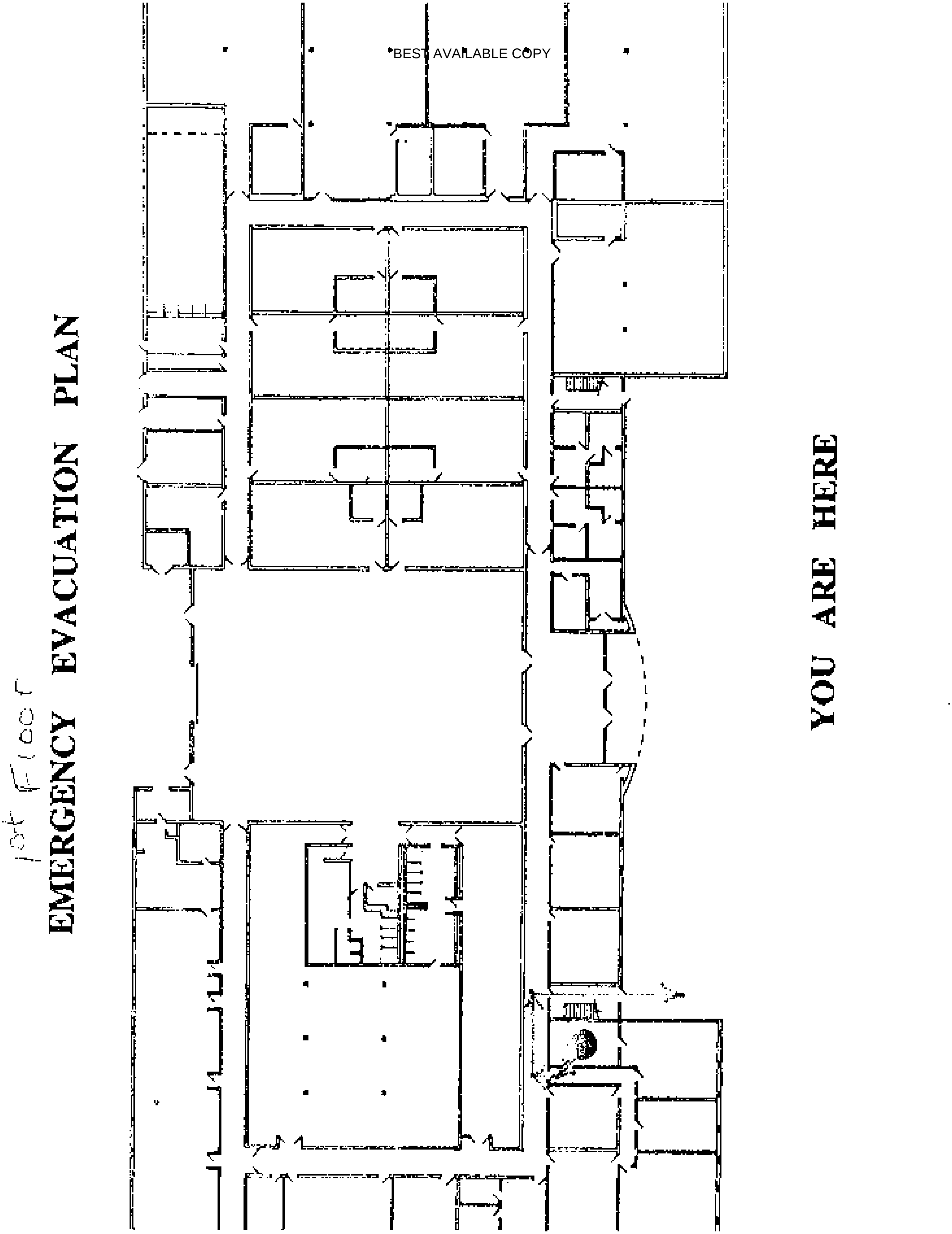

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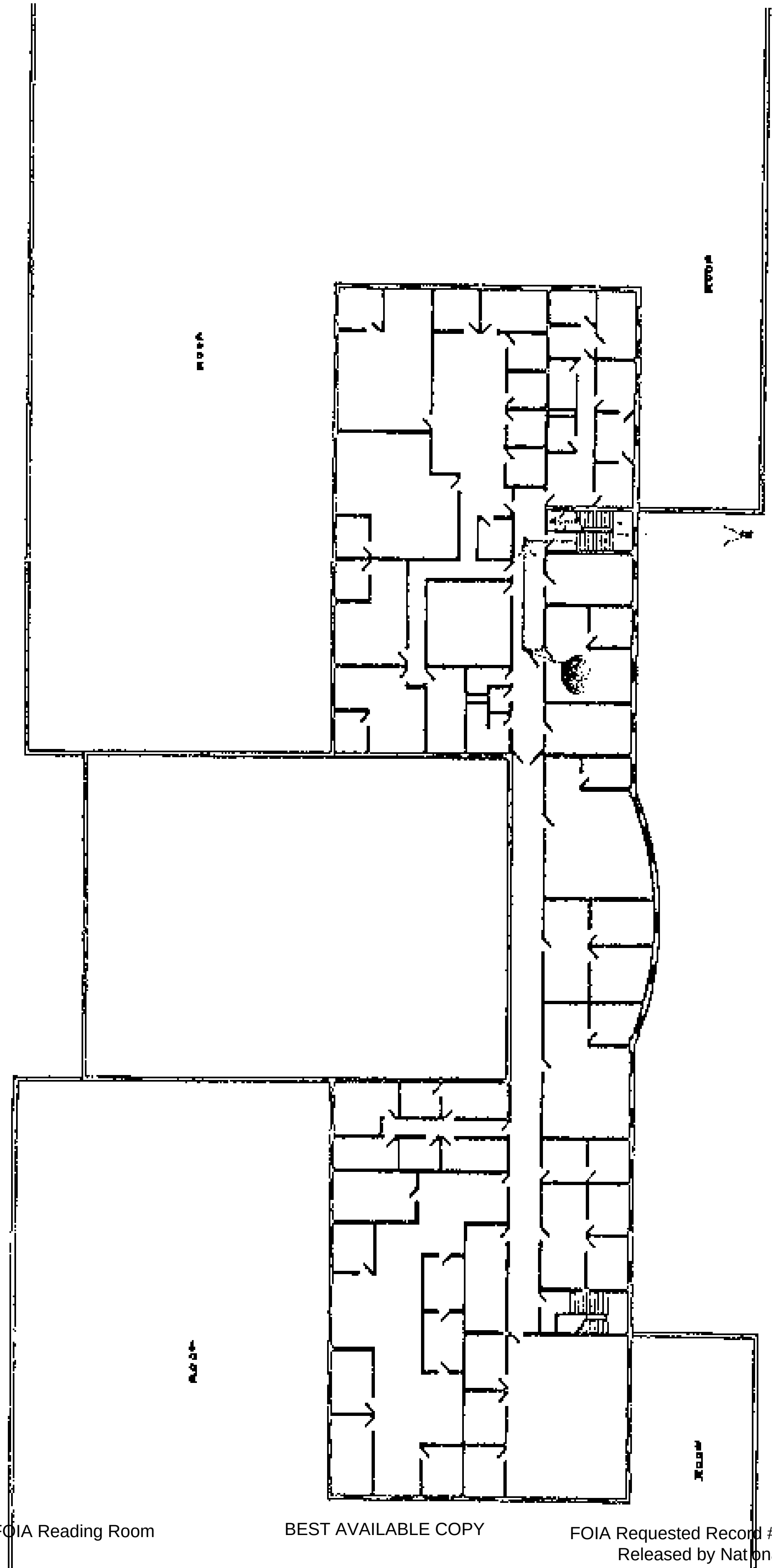
2nd floor

EMERGENCY EVACUATION PLAN



YOU ARE HERE

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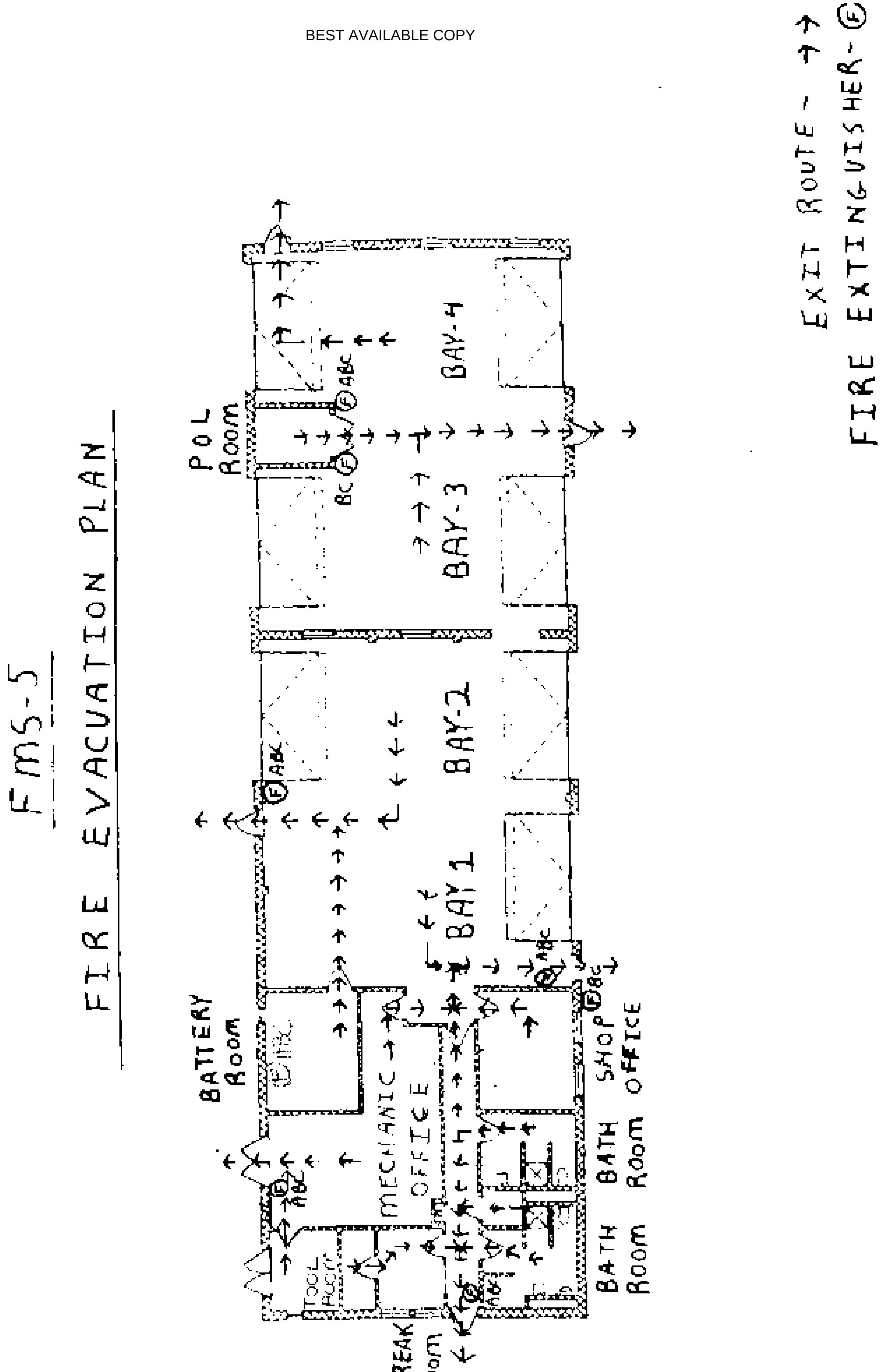
FMS-5
FIRE EVACUATION PLAN
EXIT ROUTE - →→
FIRE EXTINGUISHER - F
BAY-4
BAY-3
BAY-2
BAY 1
POL Room
BATTERY Room
MECHANIC OFFICE
TOOL ROOM
BREAK Room
SHOP OFFICE
BATH Room
BATH Room
ABC
BC

Appendix D
References

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Appendix D. References

1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead

2. American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2010 Edition

3. 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

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

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 2556 of 5269

COMPLIANCE MANAGEMENT INTERNATIONAL

1215 Manor Drive, Suite 205
Mechanicsburg, PA 17055
Phone: 717.590.7031
Fax: 717.590.7936
www.complianceplace.com

Industrial Hygiene Survey Report

National Guard Facility
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**
Report Date:	**June 26, 2013**

Non-Responsive [redacted]

Manager, Industrial Hygiene Services

Table of Contents

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on May 28, 2013, at the Edgewood Readiness Center located at Building E4305, APG-EA Edgewood, MD 21010. The survey was performed by Mr.[redacted], 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.

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Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 micrometer (um) mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2
1	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**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2 =** micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Sources:

1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges
2. OSHA 29CFR1910.1025 Lead Standard

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 "Guidelines and Procedures for Rehabilitation and Conversion of

Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Lead surface and air samples were collected. The following is a summary of the sample results from this survey.

- Surface levels of lead were below the recommended guideline of 200 ug/ft^2 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/m^3).

Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. 98011EL). The light meter was last calibrated in November 2012. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
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 130A/131A	5-40	5	Yes
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
2nd Floor Hallway	49.5	5	Yes

Table Notes:
1. FC = Foot Candles
2. **Bolded** results did not meet listed criteria

Source: ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

The lighting levels did not meet the minimum recommended guideline in the 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.

IAQ Assessment Summary

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**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **°F =** degrees Fahrenheit

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements were within recommended guidelines in all areas tested.

- Relative humidity levels were 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.

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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

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Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A. Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #100470

Client: National Guard Bureau

Address: 301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation
Havre de Grace, Maryland 21078

Attention: [redacted]

Job Name: Edgewood RC

Job Location: APG-Edgewood, MD

Job Number: Not Provided

P.O. Number: W912K6-09-A-0003

Chain Of Custody: 515991

Date Submitted: 5/30/2013

Person Submitting: [redacted]

Date Analyzed: 6/6/2013 **Report Date:** 6/6/2013

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
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/ft²	<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/ft²	<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/ft²	
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.

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #100470

Client:	National Guard Bureau	**Job Name:**	Edgewood RC	**Chain Of Custody:**	515991
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	APG-Edgewood, MD	**Date Submitted:**	5/30/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	6/6/2013 **Report Date:** 6/6/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)
%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.
Air and Wipe results are not corrected for any blank results
Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.
All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: N. McGarvey / S. Chinnapad

Technical Manager: G Edward Carney

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.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 515991

page 1 of 2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Edgewood RC
2. Job Location: APG-Edgewood, MD
3. Job #: [redacted] P.O. #: W912K6-09-A-0003
4. Contact Person: [redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due: ______
☐ 24 Hours Time Due: ______
Comments: ______

NORMAL BUSINESS HOURS
☐ Immediate ☐ Next Day ☐ 2 Day
☐ 3 Day ☒ 5 Day + NOW Date Due: 6/6/13
☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

REPORT TO:
☒ Inclu[redacted]ith Report
☒ [redacted] compliance@place.com
☐ Fax: [redacted]us.army.mil
☐ Verb[redacted]us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ______ (QTY)
☐ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ______ (QTY)
☐ NIOSH 7402 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ______ (QTY)
☐ EPA Point Count ______ (QTY)
☐ NY State Friable 198.1 ______ (QTY)
☐ Grav. Reduction ELAP 198.6 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ______ (QTY)
☐ NY State PLM/TEM ______ (QTY)
☐ Residual Ash ______ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
☐ Quan. (s/area)Dust D6480-99 ______ (QTY)
TEM Water
☐ Qual. (pres/abs) ______ (QTY)
☐ ELAP 198.2/EPA 100.2 ______ (QTY)
☐ EPA 100.1 ______ (QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples ______ °C)

Metals Analysis
☐ Pb Paint Chip ______ (QTY)
☒ Pb Dust Wipe (wipe type ______) ______ (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ______ (QTY)
☐ Pb TCLP ______ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ______) ______ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
☐ Spore-Trap ______ (QTY) ☐ Surface Vacuum Dust ______ (QTY)
☐ Surface Swab ______ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ______ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1	Fitness Room	5/28	370	1000mL				X		X						
2	Hallway 140A		368	↓ NL				X		X						
3	Blank		0	NL				X		X						
4	Hallway Outside FR			100cm²				X				X				
5	131B Floor							X				X				
6	131B Floor							X				X				
7	131A HVAC							X				X				
8	131A Storm Ite							X				X				
9	Kitchen Table							X				X				
10	101-A Heater							X				X				
11	101-A Floor							X				X				
12	110B Floor			↓												

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 5 /30 /13 @1030 Via: Fedex By (Print): NWM Sign: [signature]
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ___/___/___ Time: ______ Initials: ______
4. Comments: ______

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Focused on Results www.amalab.com
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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 515991
page 2 of 2

Mailing/Billing Information:
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2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Edgewood RC
2. Job Location: ANG- Edgewood, MD
3. Job #: [redacted] PO #: W912K6-09-A-0003
4. Contact Person: [redacted] @ phone #: (410) 942-0273
5. Submitted by: [redacted] nature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day ☐ Results Required By Noon
☐ Next Day ☐ 5 Day + (EveryAttempt Will Be
☐ 2 Day Date Due: Made to Accomodate)

REPORT TO:
☒ Include [redacted] with Report
☒ Email: [redacted] @compliancepleac.com
☐ Fax: [redacted] @us.army.mil
☐ Verbal: [redacted] @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area)Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☒ Pb Dust Wipe (wipe type ____) ____ (QTY)
☐ Pb Air 5 (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
202B Conf Table RC																
13	202C Conf. Table	5/28		100cm²				X				X				
14	204A Table	↓		↓				X				X				
15	201P HVAC Supply	↓		↓				X				X				
16	Blank	↓		–				X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY (CUSTODY)
1. Date/Time RCVD: ___/___/___ @ ___ Via: ___ By (Print): ___ Sign:
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ___ Sign:
3. Results Reported To: ___ Via: ___ Date: ___/___/___ Time: ___ Initials:
4. Comments:

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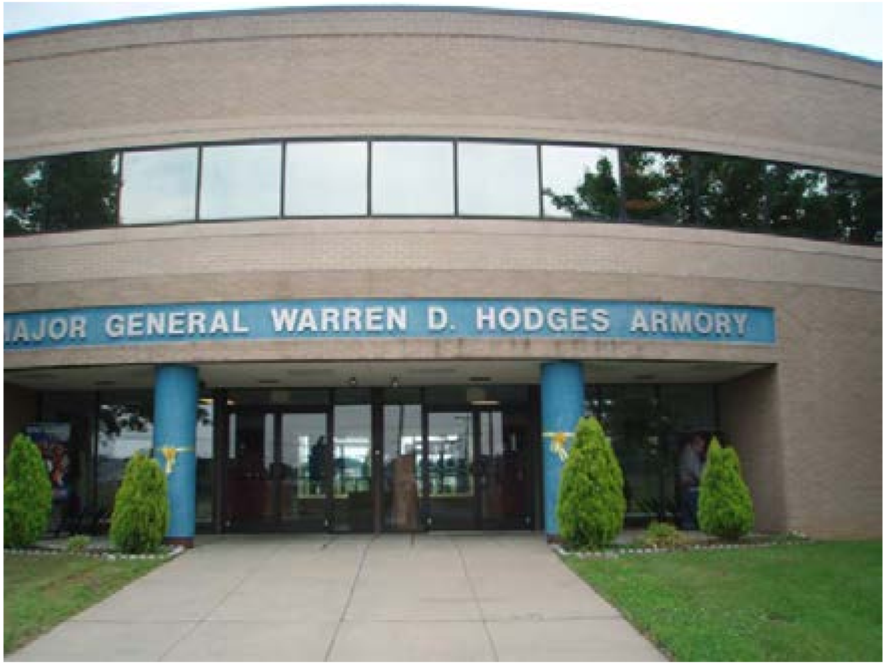
May, 2018

Appendix B. Photographs

Edgewood Readiness Center Photo Log
5/28/2013



Entrance

Location

Front of Building

Front of Building

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Boilers

Fitness Center (Previously Firing Range)

Assembly Hall

Fungal Growth on Ceiling in Men's Restroom by Assembly Hall

Appendix C. Floor Plan

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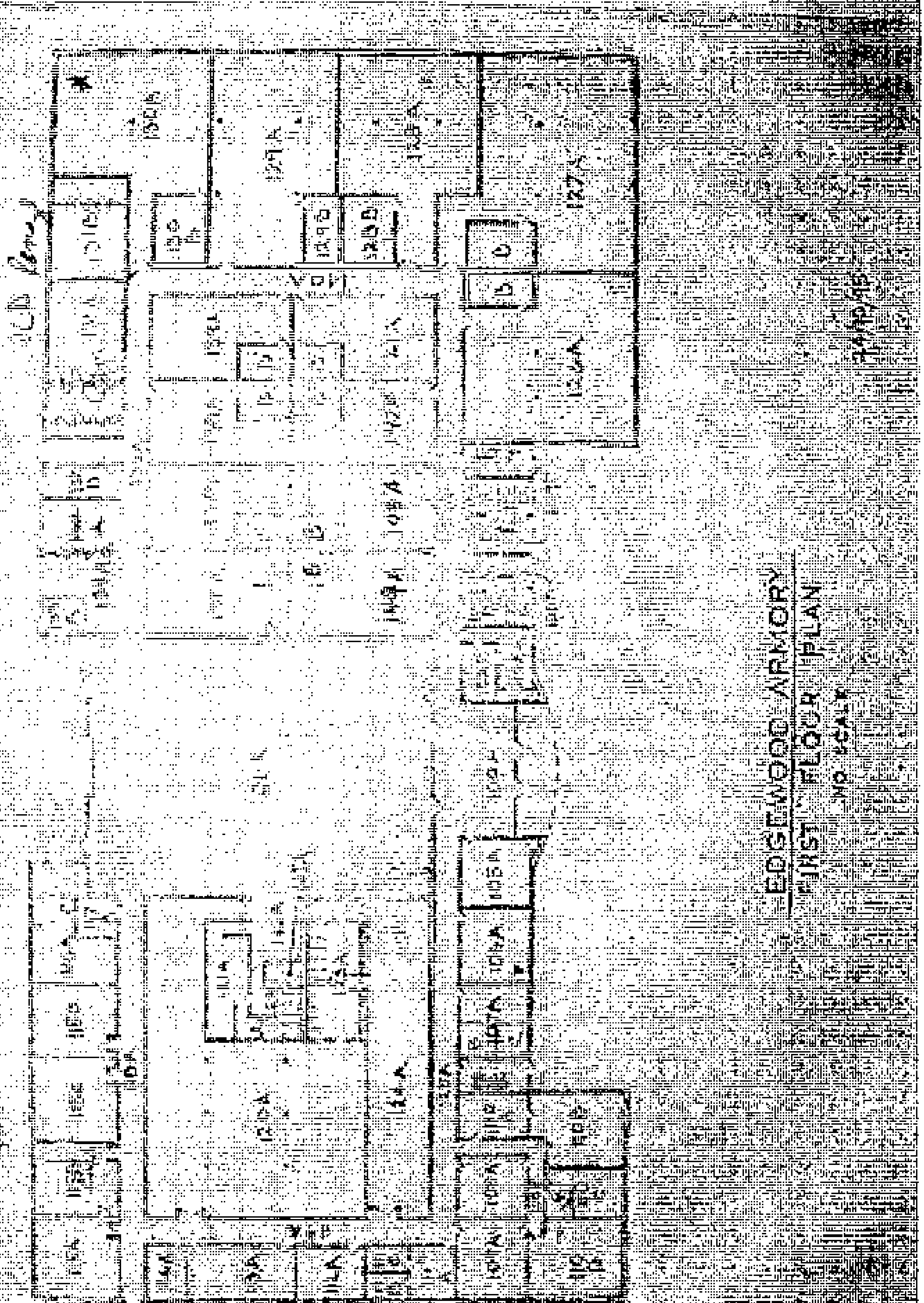
EDGEWOOD ARMORY
FIRST FLOOR PLAN
NO SCALE

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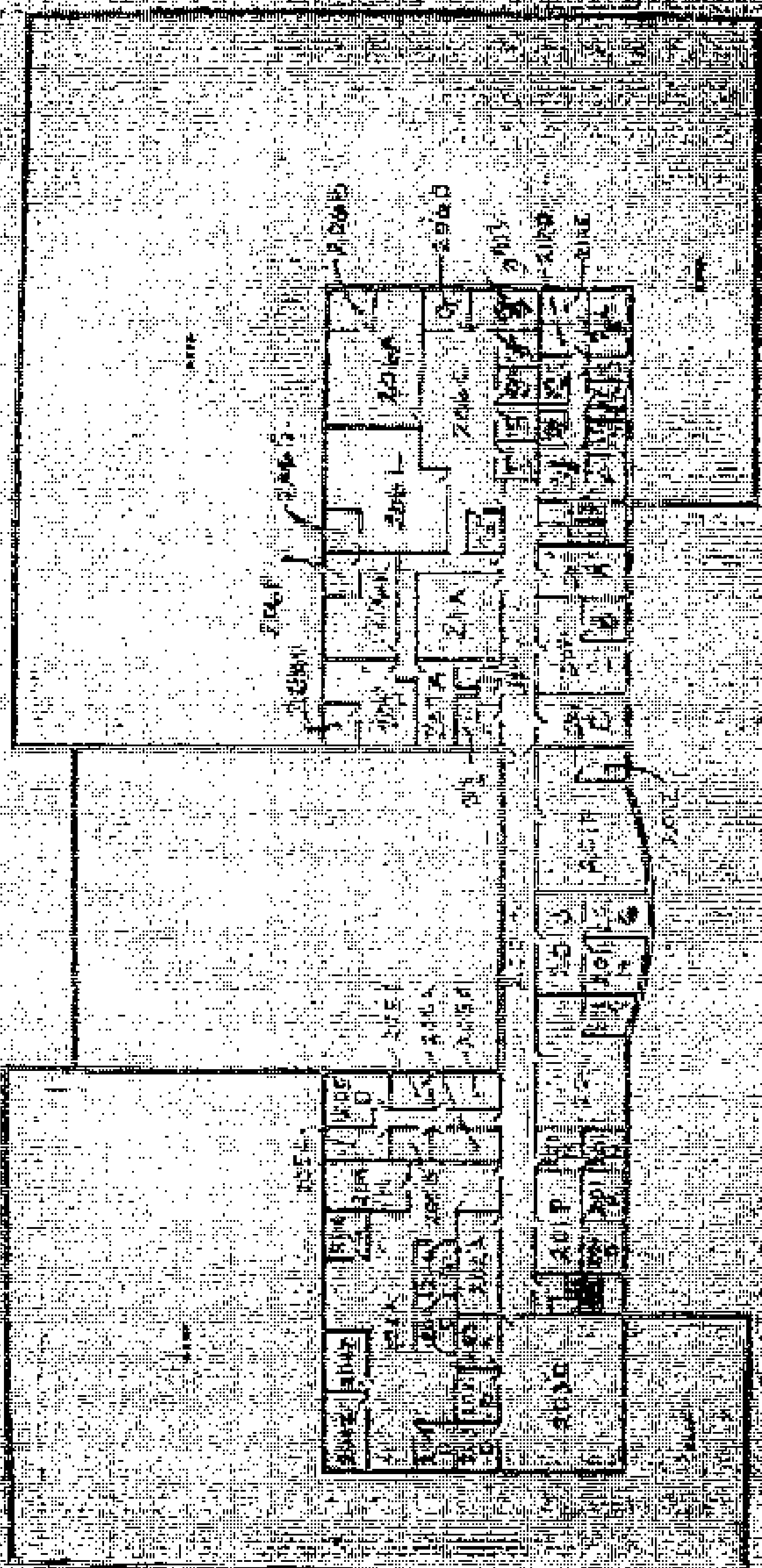

EDGEWOOD ARMORY
SECOND FLOOR PLAN
NO SCALE

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May 2018

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FOIA Requested Record
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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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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

MEMORANDUM FOR Region North Industrial Hygiene Office (NGB-AVS-SI-IH/ Ms. [redacted] Army National Guard Bureau, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, 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. [redacted] at commercial (410)436-5474/3118, DSN 584-5475/3118, or by electronic mail: [redacted]@us.army.mil

FOR THE COMMANDER:

Encl

[redacted]
Director, Occupational Health Sciences

Readiness thru Health

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U.S. Army Center for Health Promotion and Preventive Medicine

USACHPPM

CONSERVARE SALUTEM

MARYLAND ARMY NATIONAL GUARD FACILITIES
INDUSTRIAL HYGIENE BASELINE SURVEYS
LTC JAMES VICTOR MCCOOL ARMORY
ELKTON, MD
PROJECT NO. 55-ML-01ED-03/05

Approved for public release; distribution unlimited

CHPPM FORM 432-E (MCHB-CS-IPD), OCT 03

Readiness Thru Health

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U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed $3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- ♦ *Integrity is the foundation*
- ♦ *Excellence is the standard*
- ♦ *Customer satisfaction is the focus*
- ♦ *Its people are the most valued resource*
- ♦ *Continuous quality improvement is its pathway*

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

CHPPM FORM 432-E (MCHB-CS-IPD), OCT 03 *(reverse)*

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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
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 lead-contaminated 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. Asbestos Exposure. 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.

Readiness thru Health

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c. Mold Exposure. Excessive moisture in the armory has caused mold growth.

d. Safety Hazards. 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. Additional Building Concerns. 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. Lead Exposure. 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 as extra protection when working in areas identified as having elevated levels 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. Asbestos Exposure. 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. Mold Exposure. 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. Safety Hazards. 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.

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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
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. [redacted], 28 February 2003, subject: SAB

4. BACKGROUND INFORMATION.

a. Armory Mission. 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. Facility Use by Children. 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. Sampling. 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) [redacted] 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 [redacted] 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. Safety and Industrial Hygiene Programs. The only written program records at the armory are for the Hazardous Communication Program.

e. Heating, Ventilation, and Air-Conditioning System. 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. Lighting. All areas of the armory were judged to be adequately lit and occupants reported no areas of deficient lighting.

h. Converted Indoor Firing Range. SSG [redacted] 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. Lead in Air. The Army occupational exposure limit for lead in air is the Occupational Safety and Health Administration (OSHA) 8-hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter (μg/m³) of air.

b. Lead in Dust. The Environmental Protection Agency (EPA) and State of Maryland limits for lead in dust are 40 micrograms per square foot (μg/ft²) on floors, 250 μg/ft² on window sills, and 400 μg/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. The NGB Region North concurs with the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended safe limit of 200 μg/ft² on floors and frequently contacted surfaces.

c. Lead in Paint. Paint containing lead levels of 0.5% or more by weight in dried solid (also reported as 5000 milligrams per kilogram) is considered to be lead-based paint according to both Federal and Maryland State Regulations. Paint containing lead levels of more than 0.7 milligrams per square centimeter is considered to be lead-based paint according to Maryland State Regulations. In Army Regulation 420-70, Buildings and Structures, lead-contaminated paint is defined as any paint containing detectable amounts of lead. The Army considers lead-contaminated paint to be potentially hazardous to children if it is disturbed or deteriorating.

d. Lead Carcinogenicity. The Department of Health and Human Services National Toxicology Program (NTP) released the Report on Carcinogens, Eleventh Edition in February 2005. The NTP report lists "lead and lead compounds" as "reasonably anticipated to be human carcinogens".

7. SAMPLING RESULTS, DISCUSSION AND CONCLUSIONS.

a. Lead in Air. All air sample results were below the laboratory analytical detection limit for lead of 3 μg/m³ as well as the OSHA standard of 50 μg/m³ for lead in air.

b. Lead in Paint. 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. Lead in Dust. 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 μg/ft² for lead in dust on frequently contacted surfaces. The converted range room metal target stand surface wipe result was 318 μg/ft². The top of the refrigerator surface wipe sample was 478 μg/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. Child Lead Exposure. 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. Asbestos Exposure. 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. Mold and Moisture Exposure. 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. Safety Hazards. 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.

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8. RECOMMENDATIONS.

a. Lead Exposure. 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 as extra protection when working in all areas identified as having elevated levels 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. Asbestos Exposure. 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. Mold Exposure. 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. Safety Hazards. The RAC for safety hazards associated with the ceiling tiles is RAC 3. Replace loose ceiling tiles.

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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: [redacted]@us.army.mil

[redacted]
Industrial Hygienist
USACHPPM Lead and Asbestos Team Leader
Industrial Hygiene Field Services Program

APPROVED:

[redacted]
Technical Manager
Industrial Hygiene Field Services Program

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APPENDIX A

REFERENCES

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APPENDIX

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http://www.ashrae.org

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APPENDIX B

SAMPLING SHEETS AND LAB ANALYSES

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TABLE: Lead in Dust Wipe and Bulk Paint Sample Locations, Photograph Numbers, and Analytical Results

Sample Numbers	Type of Sample	Location	Photo #	Result µg/ft²
EL W01	Wipe	Drill Floor Entrance	0839	39
EL W02	Wipe	Drill Floor Middle	0840	BDL
EL W03	Wipe	Drill Floor Back of Drill Hall	0841	59
EL W04	Wipe	Drill Floor Window Sill	0843	45
EL W05	Wipe	Recreation Room Lunch Table	0846	BDL
EL W06	Wipe	Kitchen Counter	0854	BDL
ELW07	Wipe	Top of Refrigerator	-	478
EL W08	Wipe	Converted Range Floor	0848	120
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	0847	82
EL W12	Wipe	Converted Range Room Original Wall Plenum	0848	81
EL W13	Wipe	Converted Range Room New Wall Plenum	-	32
EL W14	Wipe	Converted Range Room Metal Target Stands	0848	318
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 Samples				**% Lead**
EL Bulk 1	Bulk	Drill Hall	0862	0.359
EL Bulk 2	Bulk	Room 204 Office	0861	1.118
Air Samples				**mg/m³**
ELAIR01	Air	Drill Hall	0862	BDL
ELAIR02	Air	Room 205	0863	BDL
ELAIR03	Air	Knotty Pine Room	0846	BDL

Note: BDL = Below Detection Limit.

TEST REPORT
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8/11/03

DATA CHEM LABORATORIES, INC.

Submitted To: [redacted]
US Army CHPPM
Bldg. 1570 Stark Road
APG, MD 21015

Reference Data:	**Lead**
Client Sample No.:	ELAIR01 through ELAIR05
P.O. No.:	Not Available
Sample Location:	Elkton Armory
Sample Type:	Filter
Method Reference:	NIOSH 7300
DCL Set ID No.:	03-S-3782
DCL Sample ID No.:	03-23206 through 03-23210
Sample Receipt Date:	8/5/2003
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.

[redacted]
Analyst

[redacted]
Reviewer

CINCINNATI OFFICE
4388 GLENDALE-MILFORD ROAD
CINCINNATI, OHIO 45242-3706
513 733-5336, FAX 513 733-5347

WEST COAST OFFICE
11 SANTA YORMA COURT
NOVATO, CALIFORNIA 94945
800 280-8071, FAX 415 893-9469

Results
Lead

Client #	DCL #	Sample Volume (L)	µg/sample	mg/m^3
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	
% Recovery	LCS		99.	
RPL			1.	

ND = not detected at or above the reporting limit (RPL).
LCS = laboratory control sample.

Non-Responsive [redacted]
Analyst

Non-Responsive [redacted]
Reviewer

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE 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 ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (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

Data Qa

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RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD IN PAINT

RES Job Number:	**RES 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 ID Number	Lab ID Number	Detection Limit (%)	LEAD CONCENTRATION (%)
ELBULK1	EM 796367	0.005	0.359
ELBULK2	EM 796368	0.005	1.118

BDL = Below Detection Limit

Data Qa

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APPENDIX C

PHOTOGRAPHS

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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
0848	Converted Range Room Metal Target Stands and Original Wall Plenum/ Lead Wipe Sample
0849	Converted Range Floor Original Air Outlet/ Lead Wipe Sample
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

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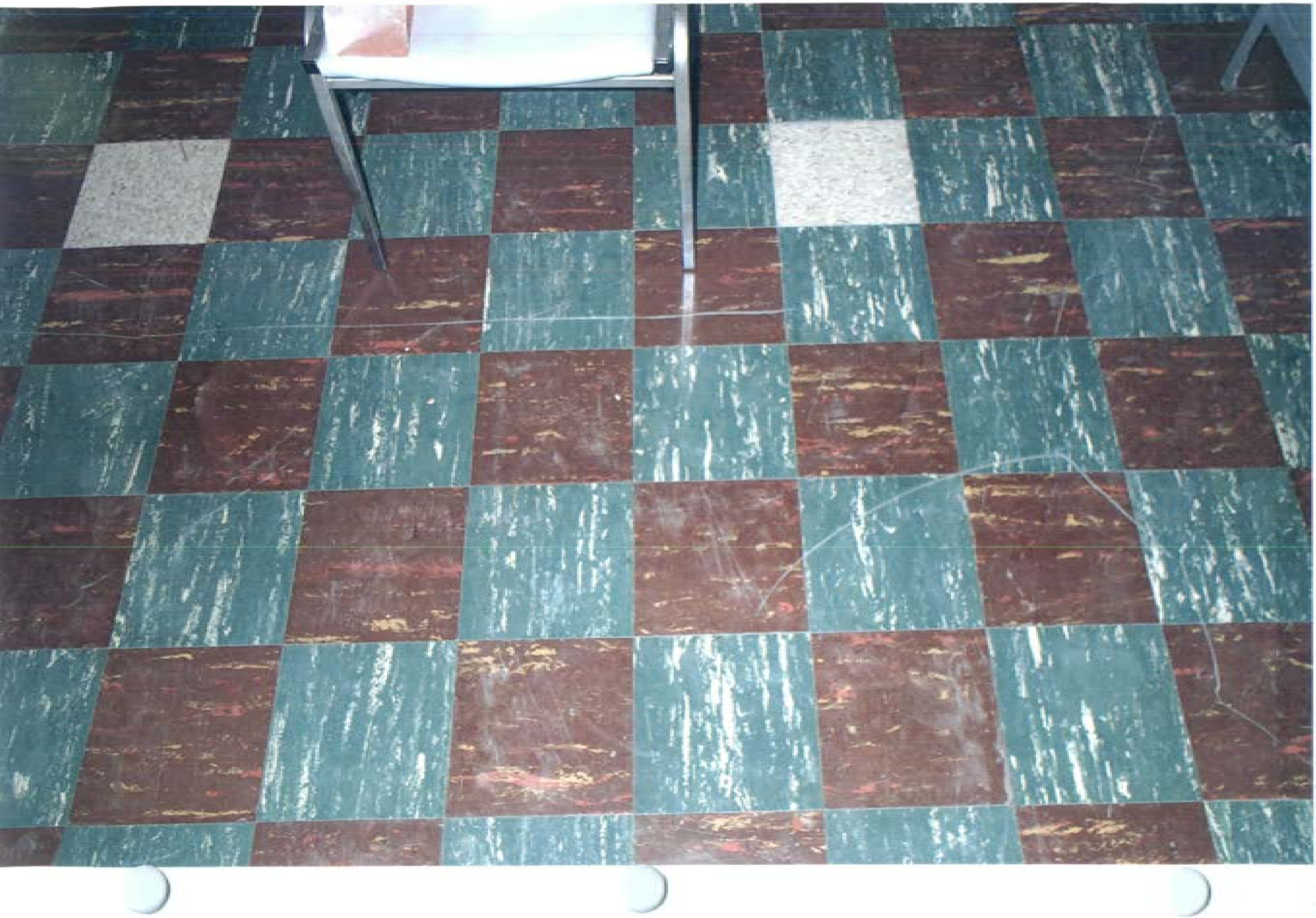

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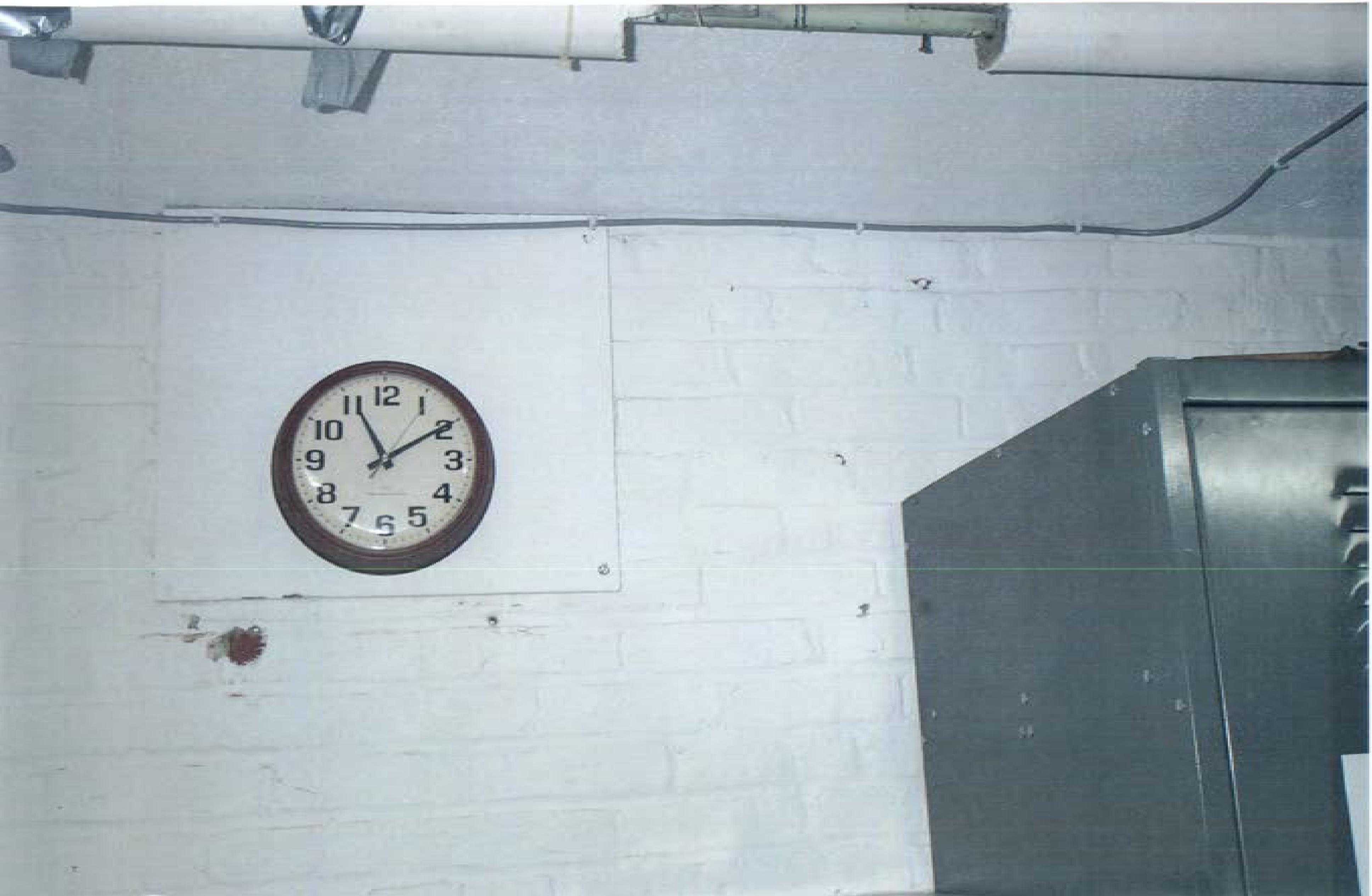

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APPENDIX D

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE

ASSESSMENT CRITERIA FOR LEAD

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SUBJECT: National Guard Bureau Region North Industrial Hygiene Office
Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 µg/ft². This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. EPA standards (40 CFR 745.227(e) (8) (viii)) and State of Maryland standards are not directly applicable because they are developed for floors (40 µg/ft²), windowsills (250 µg/ft²)and window troughs (400 µg/ft²) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. OSHA has no specific requirement for work area surfaces. The OSHA lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. OSHA cites a level of 200 µg/ft² in OSHA Instruction CPL 2-2.58 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 µg/ft² is a safe surface contamination level for adult exposures. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels higher than those recommended above do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All States will receive this guidance when it is completed.

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 50 µg/m³ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

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APPENDIX E

MOLD GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

TG 277

FEBRUARY 2002

USACHPPM

Readiness thru Health

CONSERVARE SALUTEM

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

Concern about indoor exposure to mold has been increasing as the public becomes more aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions.

This document provides the best and most current guidance for remediation of clean water damage (<48 hours) and mold contamination (>48 hours) into one resourceful Army guide. This guide has been designed to provide information to facilities management individuals who have little or no experience with mold remediation. It will assist them in making a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to develop or evaluate an in-house remediation plan or evaluate a remediation plan submitted by an outside contractor. If an outside contractor is employed, they must have experience cleaning up mold. Check their references, and have them follow the recommendations presented in this document, EPA guidelines, and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). A multi-disciplinary team approach to mold concerns is best. A health and safety professional, such as an industrial hygienist, should be consulted prior to any remediation activities to assist in the project.

Molds produce tiny spores to reproduce. Mold spores float through the indoor and outdoor air continually. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or uncorrected. There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.(1)

In all situations, the underlying cause of water accumulation must be rectified or mold growth will recur. Any initial water infiltration should be stopped and clean up began immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth. (Refer to Appendix A for detailed guidance on clean water damage response). If the source of water is elevated humidity, actions to maintain the relative humidity levels below 60% to inhibit mold growth should be taken (2). Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

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MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilating, and air-conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide adequate drainage and slope the ground away from the foundation.

REMEDIATION PLANNING

- Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Select cleanup methods for moldy items (Appendix B)
- Select Personal Protection Equipment (PPE)- protect remediators (Appendix B)
- Select containment equipment - protect building occupants (Appendix B)
- Select remediation personnel who have the experience and training needed to implement the remediation plan and use PPE and containment as appropriate

REMEDIATE MOISTURE AND MOLD PROBLEMS

- Fix moisture problem, implement repair plan and/or maintenance plan
- Dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Clean and dry moldy materials (Appendix B)
- Discard moldy porous items that can't be cleaned (Appendix B)

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REMEDIATION PROCEDURES

Four levels of abatement are described below. The size of the area impacted by mold contamination primarily determines the type of remediation. The sizing levels below are based on professional judgment and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of mold and preventing dust contaminated with mold from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement. The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. (3)

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be discarded if possible. All materials to be reused should be dry and visibly free from mold. Routine inspections should be conducted to confirm the effectiveness of remediation work. (1 and 3)

The use of bleach or other biocides is questionable in most cases (8). The effectiveness of bleach in reducing living mold is dependent on concentration, residual chlorine levels, and contact time on the surface (8). All of these factors are difficult to control during remediation. Removal of all mold growth can generally be accomplished by physical removal of materials supporting active growth and thorough cleaning of non-porous materials (4). Therefore, application of a biocide serves no purpose that could not be accomplished with a detergent or cleaning agent (4).

The use of gaseous ozone or chlorine dioxide for remedial purposes is **not** recommended. Both compounds are highly toxic and contamination of occupied space may pose a health threat. Furthermore, the effectiveness of these treatments is unproven. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."(4)

FOUR REMEDIATION LEVELS

[Adapted from NYCDOH Guidelines on Assessment and Remediation of Fungi in Indoor Environments (3) and EPA (1)]

Level I: Small Isolated Areas – Total surface area affected less than 10 square feet - e.g., ceiling tiles, small areas on walls. Refer to Appendix B for detailed guidance.

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Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas used by remediation workers for egress should be cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Level II: Medium – Total Surface Area affected between 10 and 100 square feet - e.g., several wallboard panels. (See Appendix B for detailed guidance).

The following procedures *at a minimum* are recommended:

Refer to Appendix C for proper PPE selection. Limited or Full protection may be required depending on the situation.

Refer to Appendix D for Containment procedures.

The work area and areas directly adjacent should be covered with a single layer of 6 mil fire-retardant polyethylene sheet(s) and taped before remediation, to contain dust/debris.

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Seal ventilation ducts/grills in the work area and areas directly adjacent with 6 mil polyethylene sheeting. Use an exhaust fan with a High Efficiency Particulate Air (HEPA) filter to generate negative pressurization.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and surrounding areas should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level III be followed.

Level III: Large Area – Total Surface Area affected greater than 100 square feet or potential for increased occupant or remediator exposure during remediation is estimated to be significant. (See Appendix B for detailed guidance).

The following procedures are recommended:

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from occupied spaces using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

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The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft^2) follow Level I guidance for PPE and containment and for a areas (>10 ft^2) follow Medium (Level II) or when greater than 100 ft^2 follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

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Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended (7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

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Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and removed in double-bagged 6-mil plastic. When a decontamination room is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

All areas should be left dry and visibly free from contamination and debris.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air (4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If remediation sampling is necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HAZARD COMMUNICATION

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

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CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.

3. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force*, AIHA Press, Fairfax, VA, May 2001.

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APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water Damage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£	
Water-Damaged Material†	**Actions**
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours§	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans.
Ceiling tiles	• Discard and replace.
Cellulose insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	• Discard and replace.

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Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling should be pried away from wall for drying

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£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.
These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

† If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

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APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

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MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

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Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

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APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

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Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

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APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

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the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278
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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*[1] will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination[2].

Safety Tips While Investigating and Evaluating Mold and Moisture Problems[3]

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

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Communicate with building occupants at all stages of process, as appropriate[1].

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems[3].

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination[2].

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air[4]. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control[4]."

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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.

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APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

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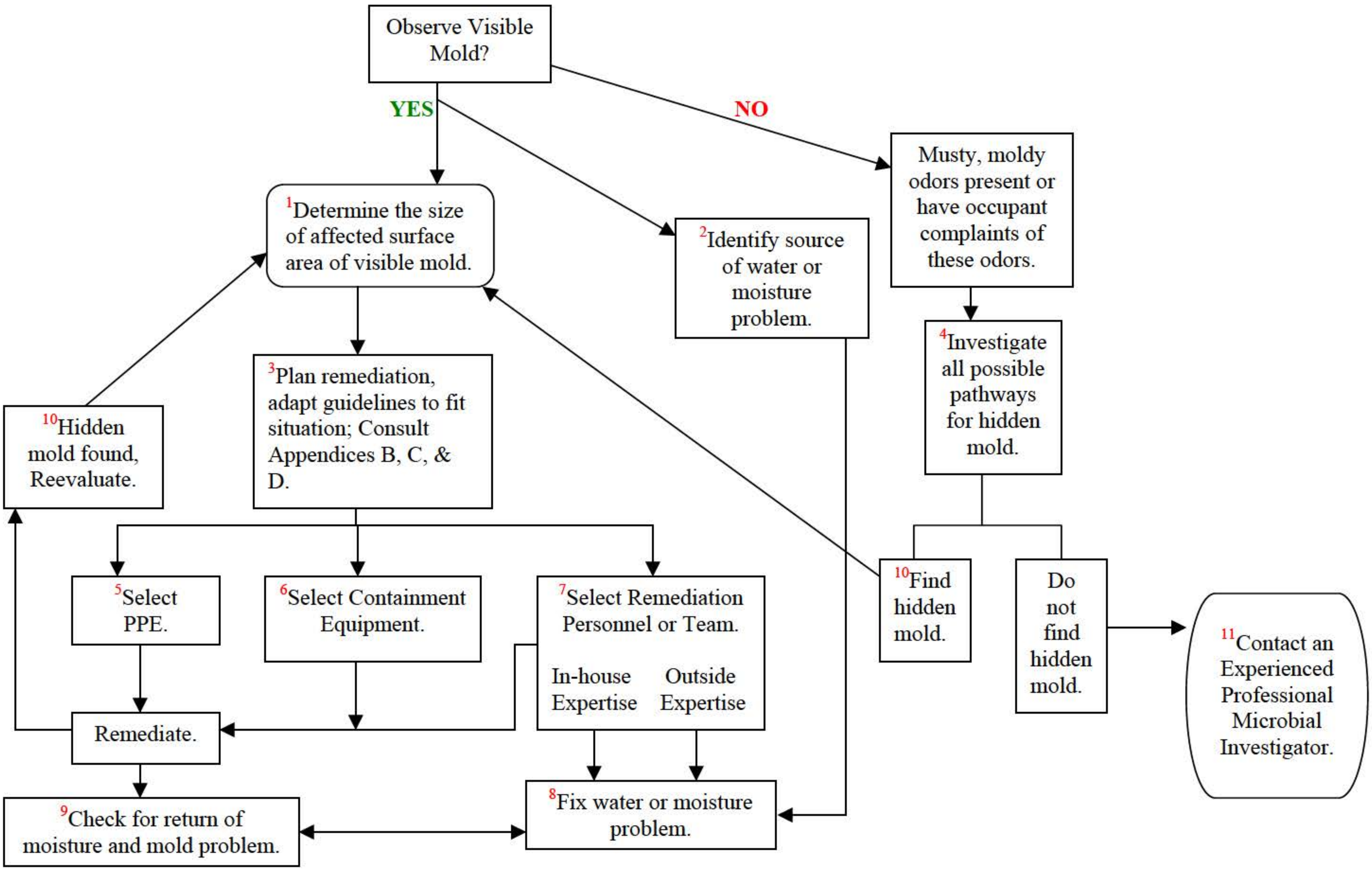
MOLD INVESTIGATION DECISION LOGIC



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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 activities[3]. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

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Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

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*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

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APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

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Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

®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.

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Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

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minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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APPENDIX F

LEAD CLEANING GUIDANCE

HUD TECHNICAL GUIDELINES FOR THE EVALUATION AND CONTROL OF LEAD-BASED PAINT HAZARDS IN HOUSING 1998

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
3. Have sufficient cleaning equipment and supplies *before* beginning work.
4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
13. Paint or otherwise seal treated surfaces and interior floors.
14. Conduct a clearance examination (see Chapter 15).
15. If clearance is not achieved, repeat the final cleaning.

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16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.

17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.

18. Cleaning equipment list:

    - HEPA vacuums.
    - Detergent.
    - Waterproof gloves.
    - Rags.
    - Sponges.
    - Mops.
    - Buckets.
    - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
    - 6-mil plastic bags.
    - Debris containers.
    - Waste water containers.
    - Shovels.
    - Rakes.
    - Water-misting sprayers.
    - 6-mil polyethylene sheeting (or equivalent).

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Chapter 14: Cleaning

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris *and* dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?
- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

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C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

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Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards *and* were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

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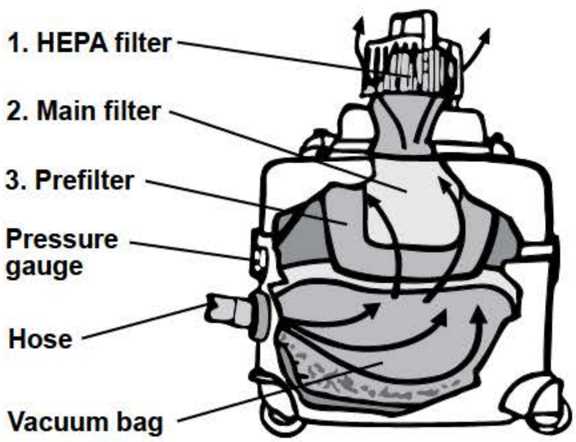
Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and pre-filter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the pre-filter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

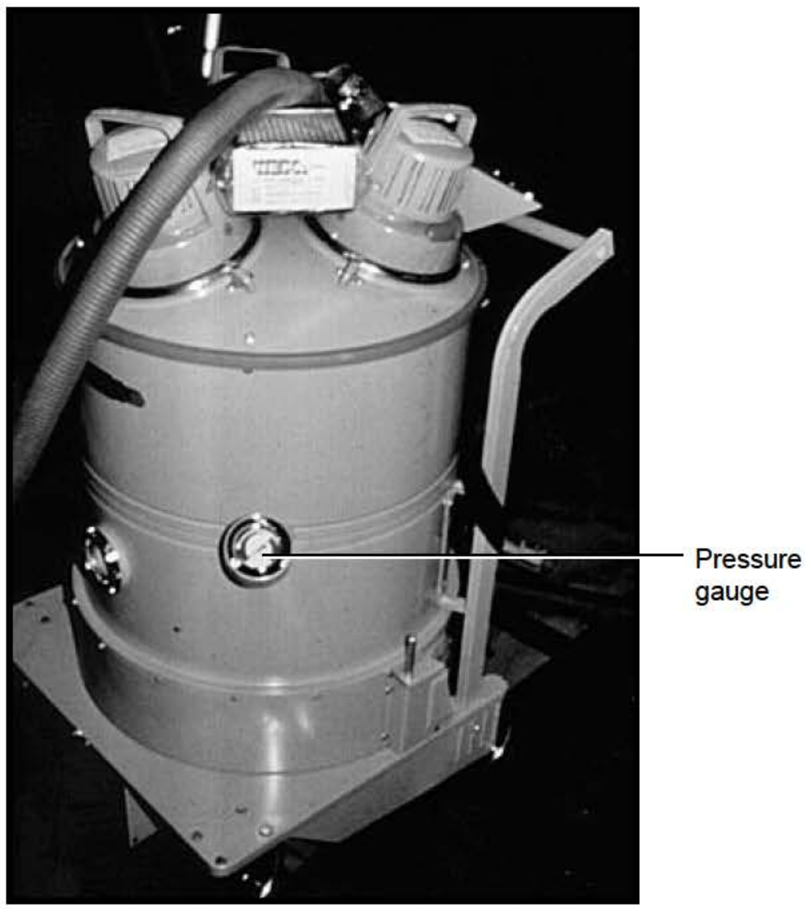


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

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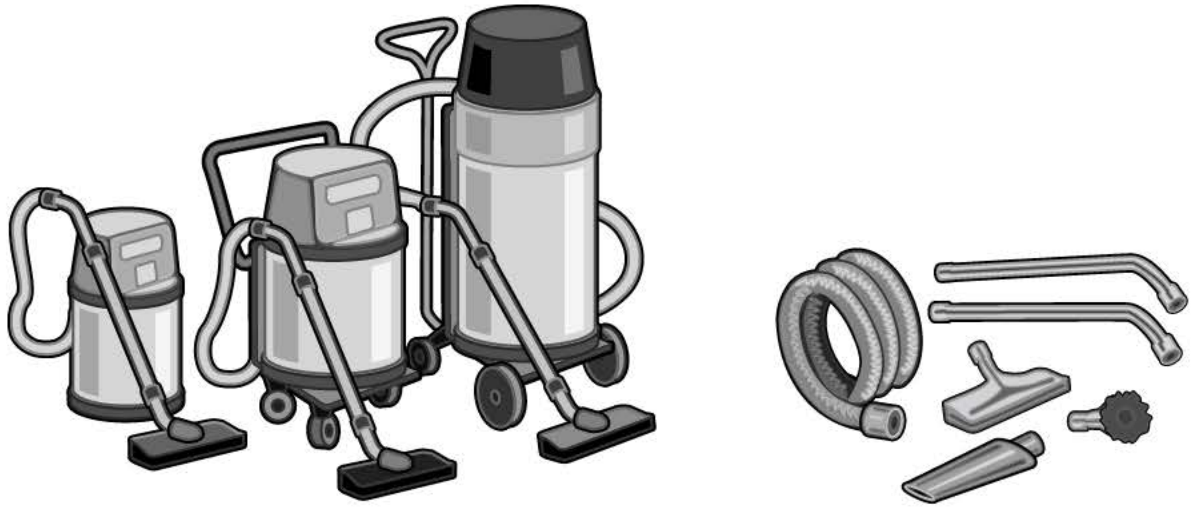
Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

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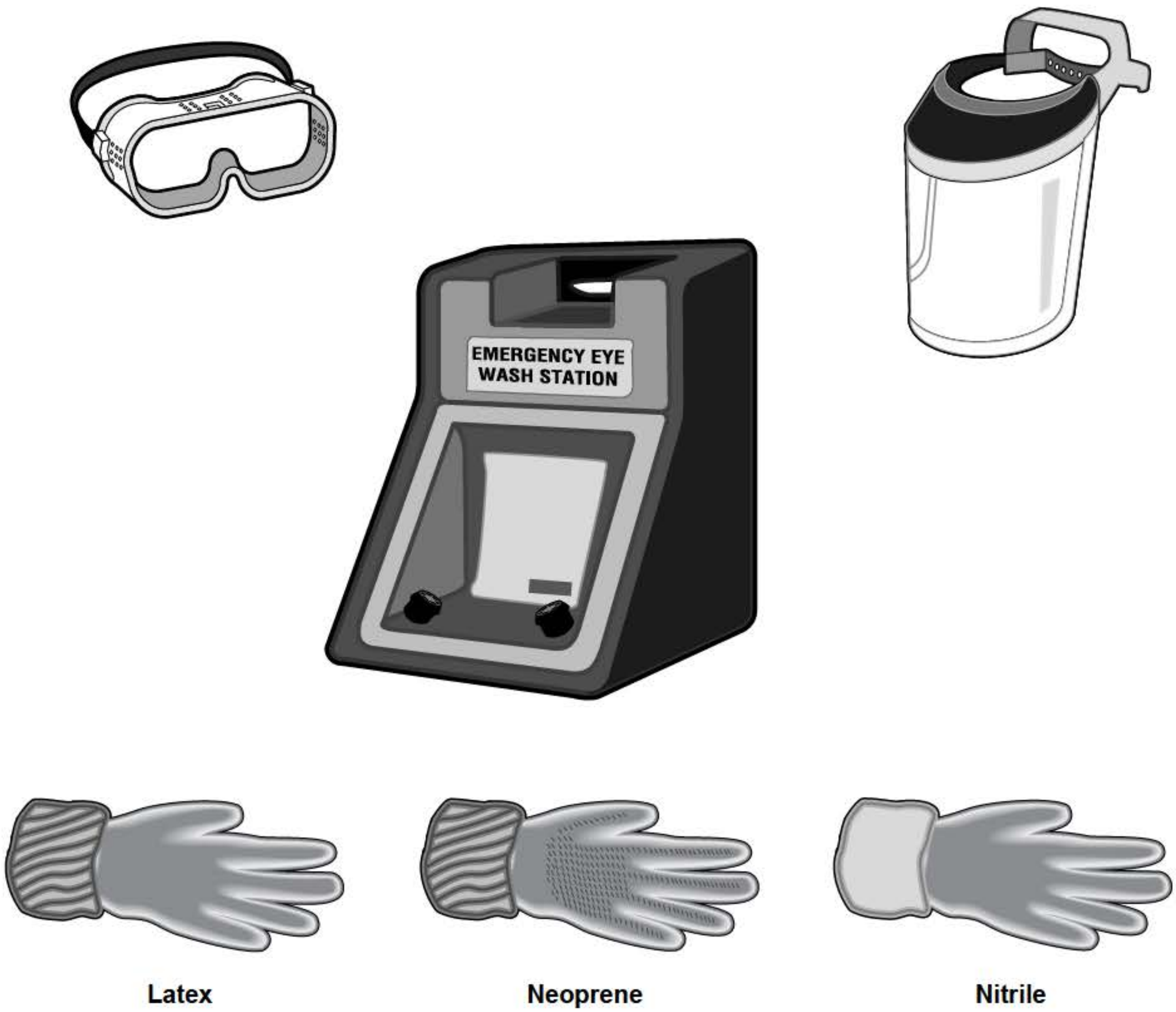
Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

- First, the area is HEPA vacuumed.

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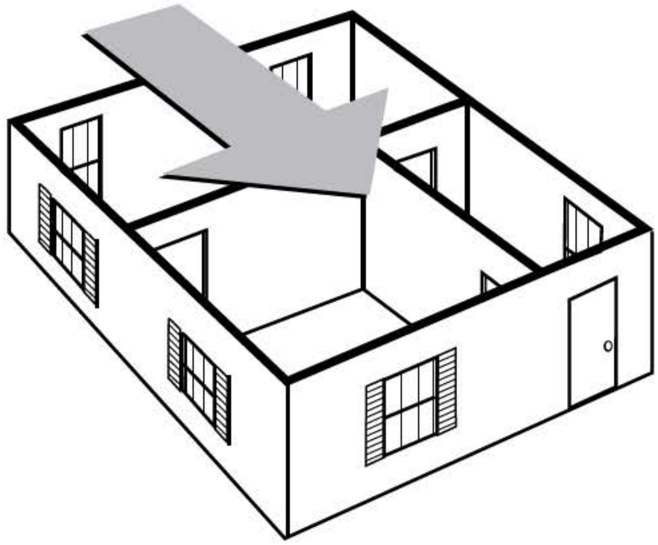
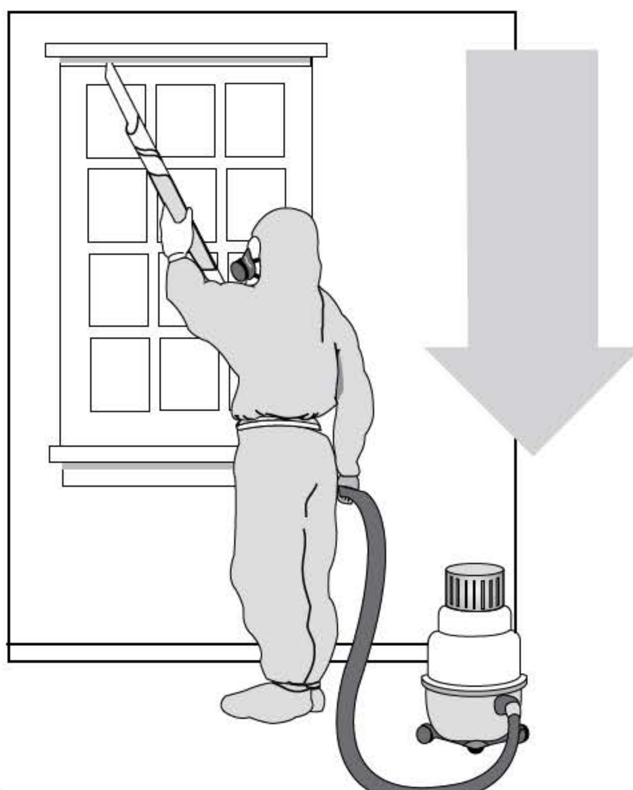
Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on, and work down to the floor. Do every inch of the windows, especially the window troughs.



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- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.

Rubber Cone

Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

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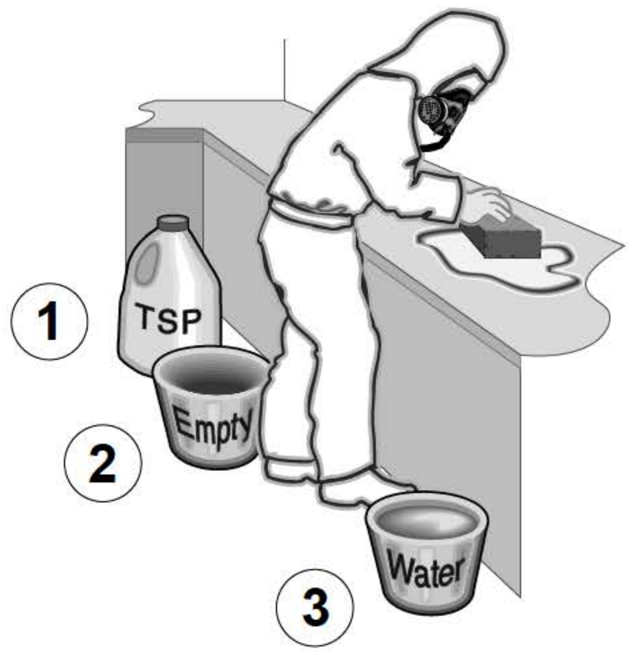
Figure 14.4c (continued)

Wash all surfaces with suitable detergents
Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces

Wet Mop Floor

Don't Dry Sweep

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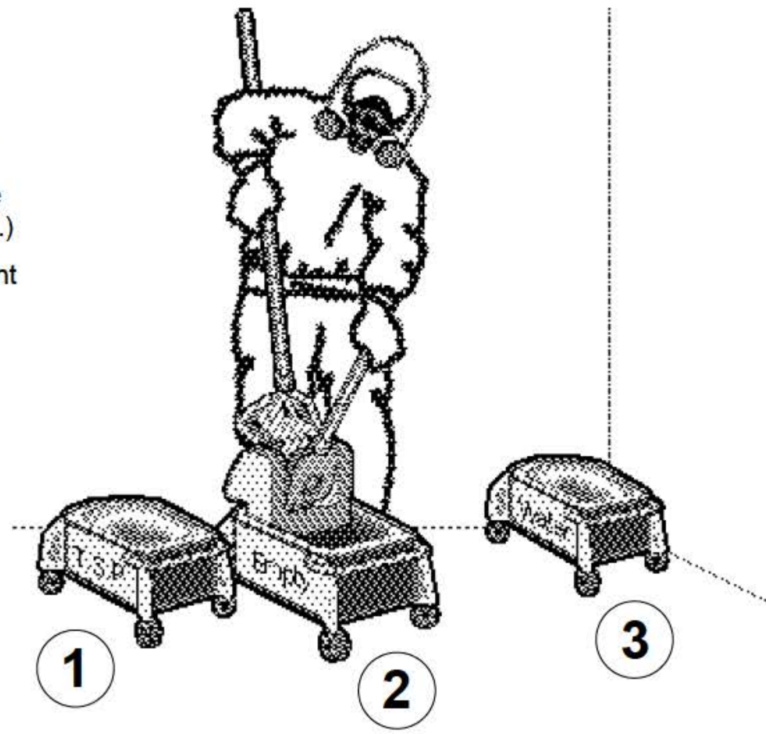
Figure 14.4c (continued)

Use the 3-Bucket System.

To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.



Squeeze out the mophead in empty bucket #2. Return to bucket #1 for more detergent solution and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

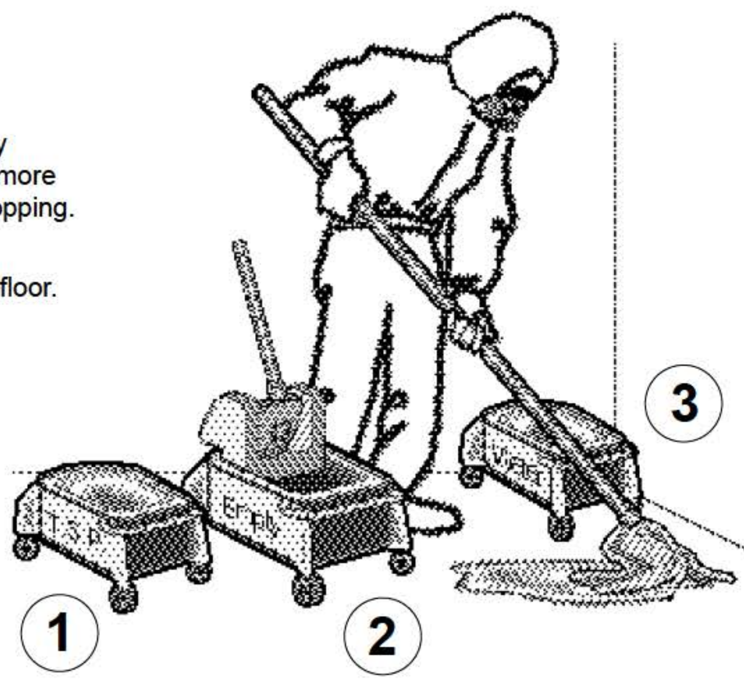


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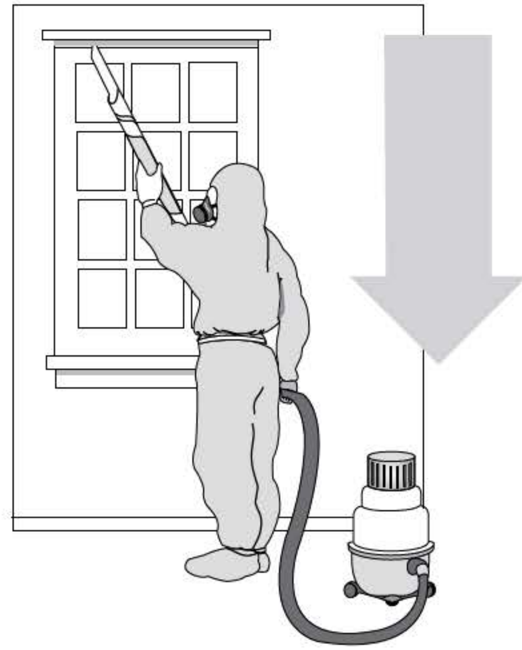
Figure 14.4d (continued)

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

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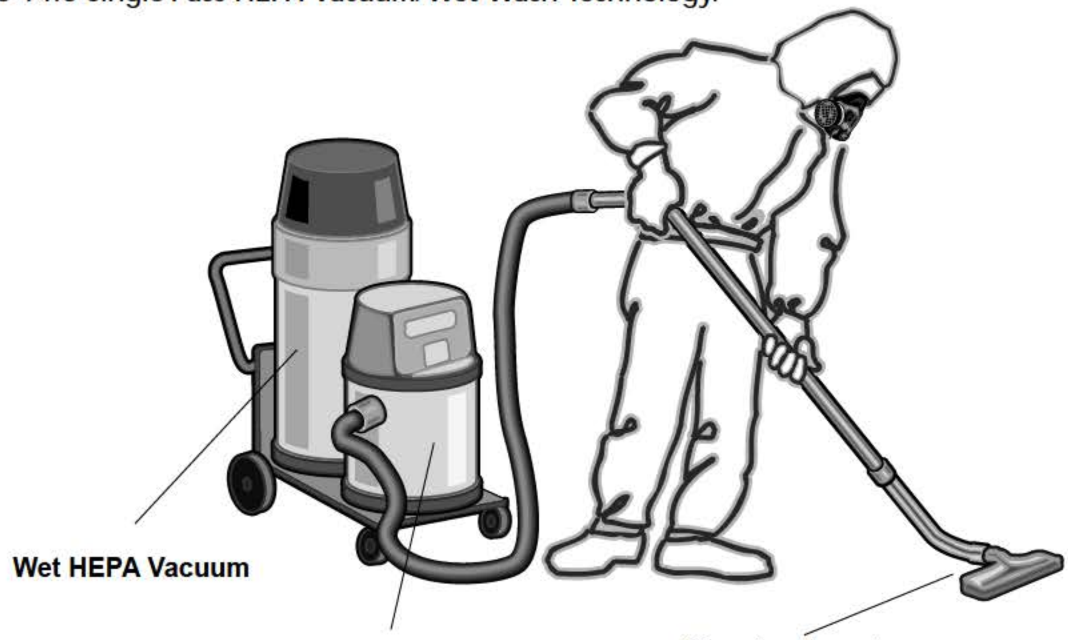
Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.



Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

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belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

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containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water *and cleaned.* All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

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the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).

Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This

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option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dust-retaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table 14.1 Initial Cleaning Wipe-Test Failure Rates for Various Abatement Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)

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and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993).

These *Guidelines* do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Cycle Number	Mass Removal Efficiency Percentages			
	Cleaning Method			
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.8	67.0	29.4
5	59.3	88.9	72.1	32.5
6	61.6	91.2	74.4	34.9
7	63.8	93.1	76.4	36.5
8	67.5	95.4	77.5	38.1
9	67.5	97.7	78.7	40.1
10	67.2	100.0	80.2	41.7
11		102.3	80.2	41.7
12		104.6	84.1	44.8
13		104.6	84.5	46.8
14		103.8	84.5	48.4
15				49.6
16				50.8
17				52.4
18				53.6
19				54.4
20				55.2

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) *Effectiveness of Clean-up Techniques for Leaded Paint Dust*

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APPENDIX G

SITE MAPS

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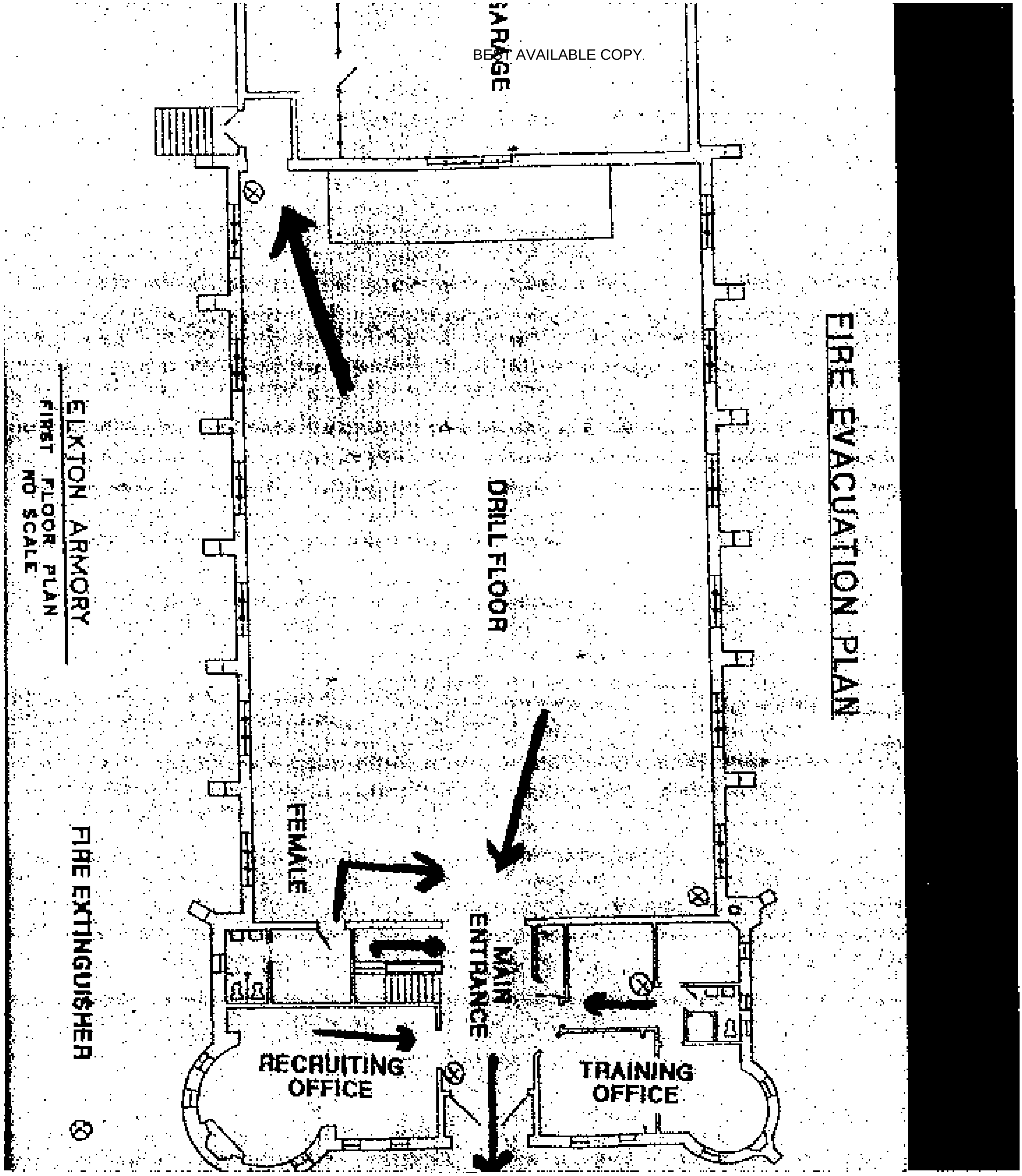
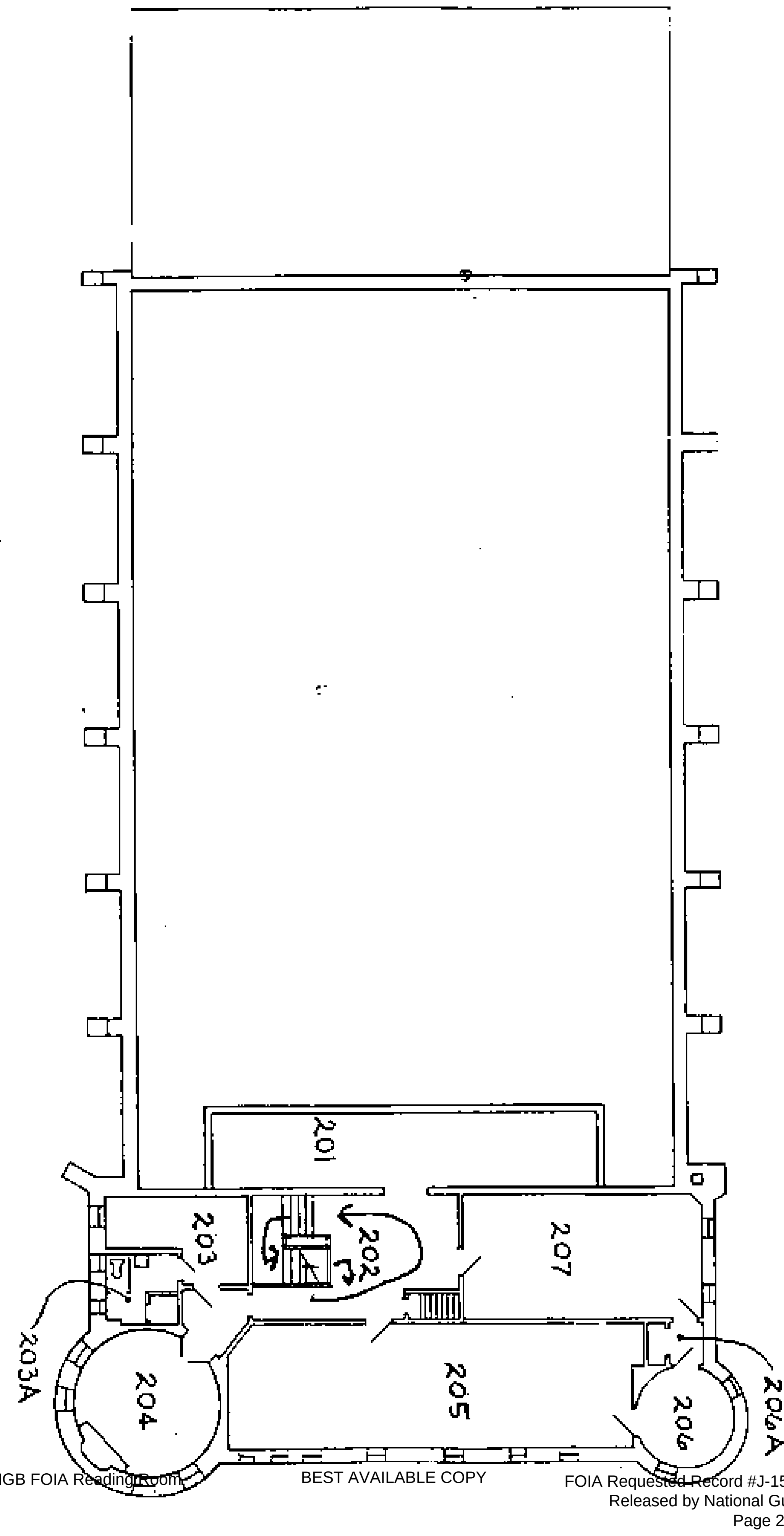


ELKTON ARMORY
SECOND FLOOR PLAN



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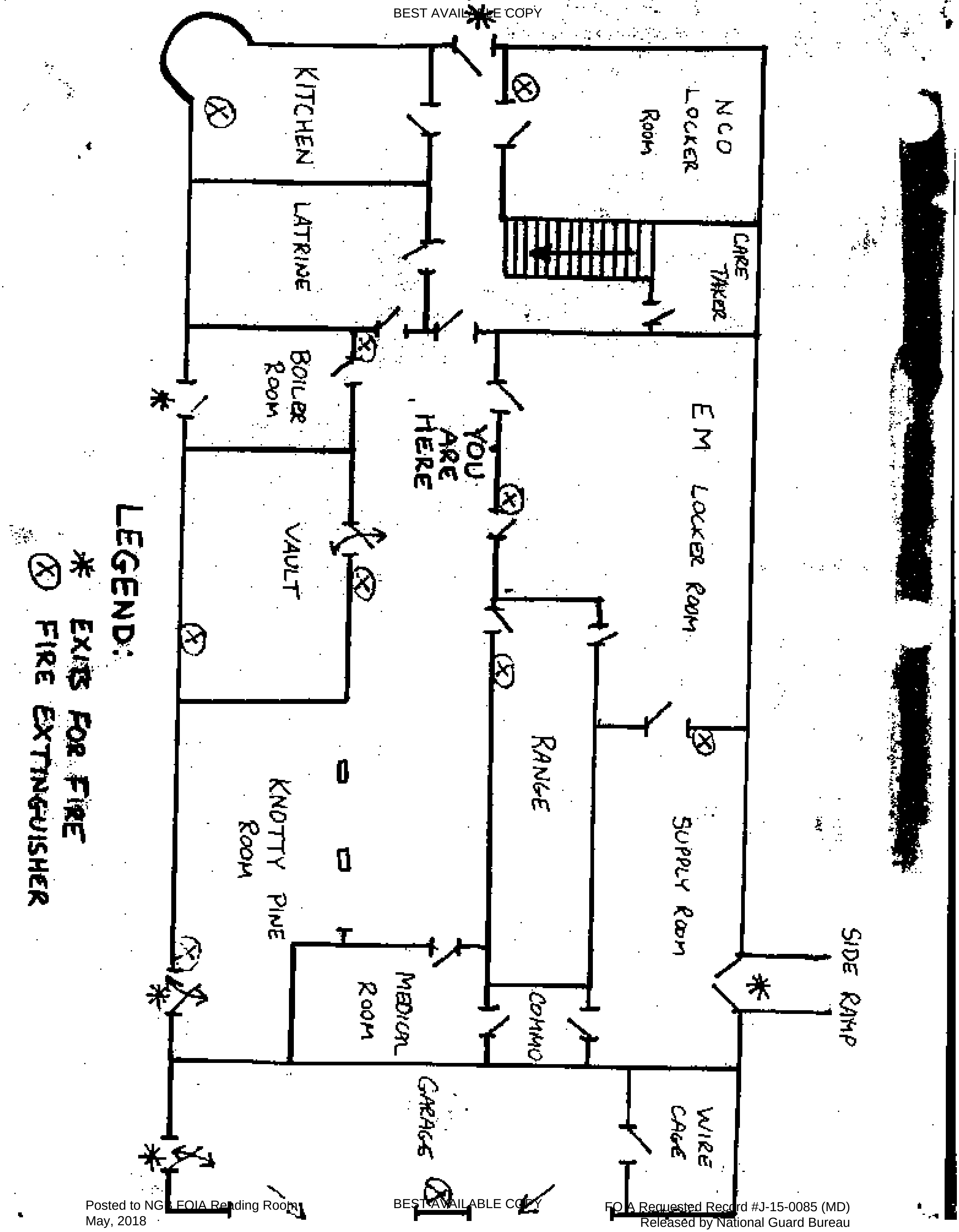

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Industrial Hygiene Study

National Guard Facility
Elkton Readiness Center
101 Railroad Avenue
Elkton, Maryland
21921-5535

Prepared for:

National Guard Bureau Region North IH Office
301-IH Old Bay Lane
Havre de Grace, Maryland
21078

Prepared by:

The EI Group, Inc.
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Report Date: December 30, 2008

Project ID: IHMO080101.03

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Senior Industrial Hygienist

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May, 2018

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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. [redacted], CIH.

Employees were not performing tasks that provided excessive noise levels, as such; noise exposure monitoring was not conducted.

Lighting within the facility was also evaluated. Lighting was found to be within applicable recommended levels.

Various surfaces within the HVAC system and throughout the facility were screened for lead. The screening was completed using surface/wipe and air samples. None of the air samples collected were found to have detectable levels of the respective lead contaminant. Lead contamination was identified in the old 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.

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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 Wipe^{TM} samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 µm MCE cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, MD for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix B.

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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/ft^2 as a benchmark for identifying contaminated surfaces. In the" Derivation of Wipe Surface Screening Levels for Environmental Chemicals", the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, HUD levels of 40 μg/ft^2 on floors and 250 μg/ft^2 on windowsills should be observed.

No detectable levels of lead were identified in those air samples collected. Currently, OSHA observed an 8-hour time weighted average of 50 ug/m^3.

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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.

Lighting

A lighting assessment was conducted throughout the facility. The survey was conducted with large bay doors closed. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. 98047EL). The light meter was last calibrated on February 22, 2008. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
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

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

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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 $^{\circ}$F with relative humidity readings ranging from 45.2 to 65.5%. During the survey, CO_2 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.

IAQ Assessment Summary

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**

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/m^3 to 2,200 spores/m^3 compared to an outdoor concentration of 16,000 spores/m^3. 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/in^2), few counts of *Aureobasidium* (9,720 spores/in^2) and hyphal fragments (11,900 spores/in^2).

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.

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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 EI Group, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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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

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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

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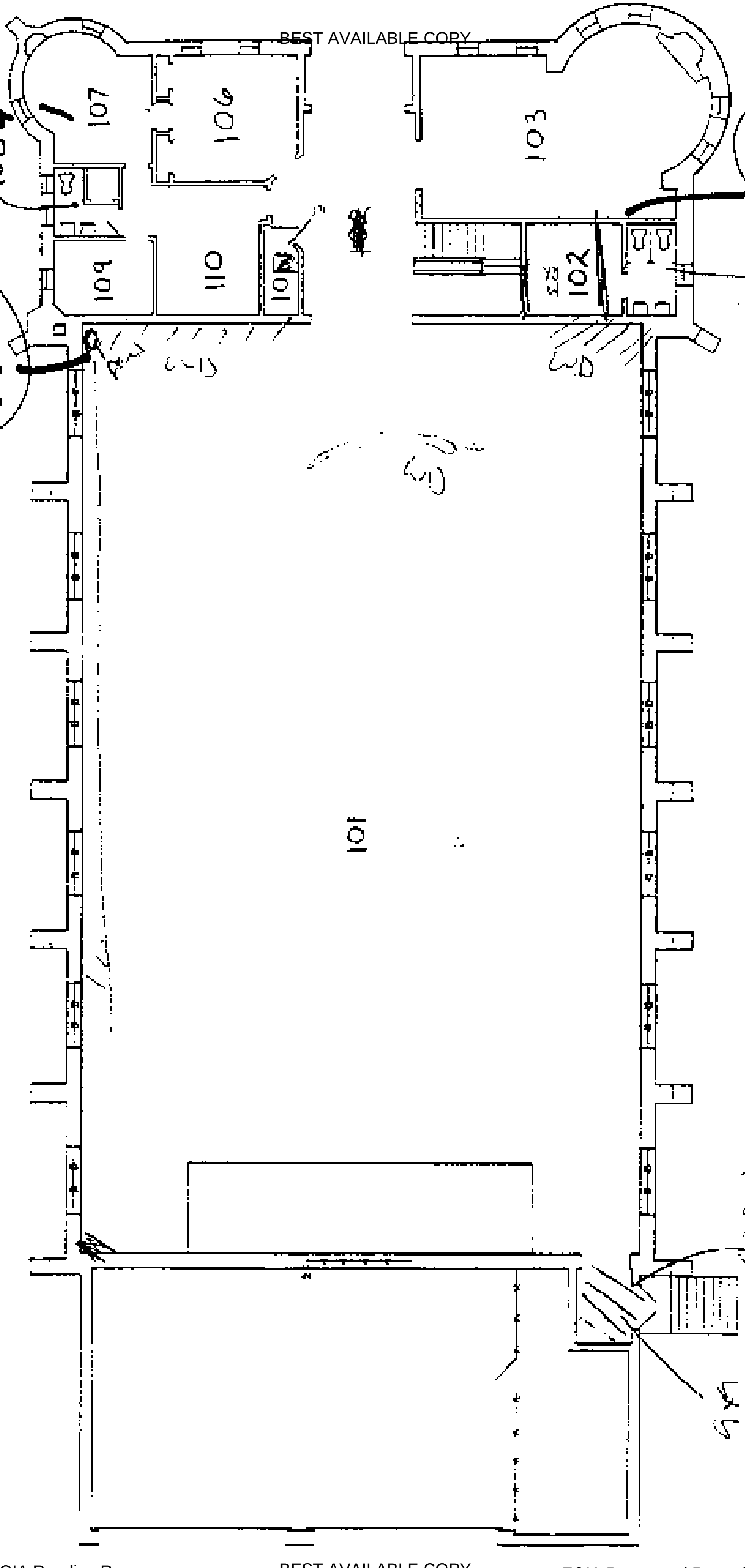

ELKTON ARMORY
FIRST FLOOR PLAN
NO SCALE

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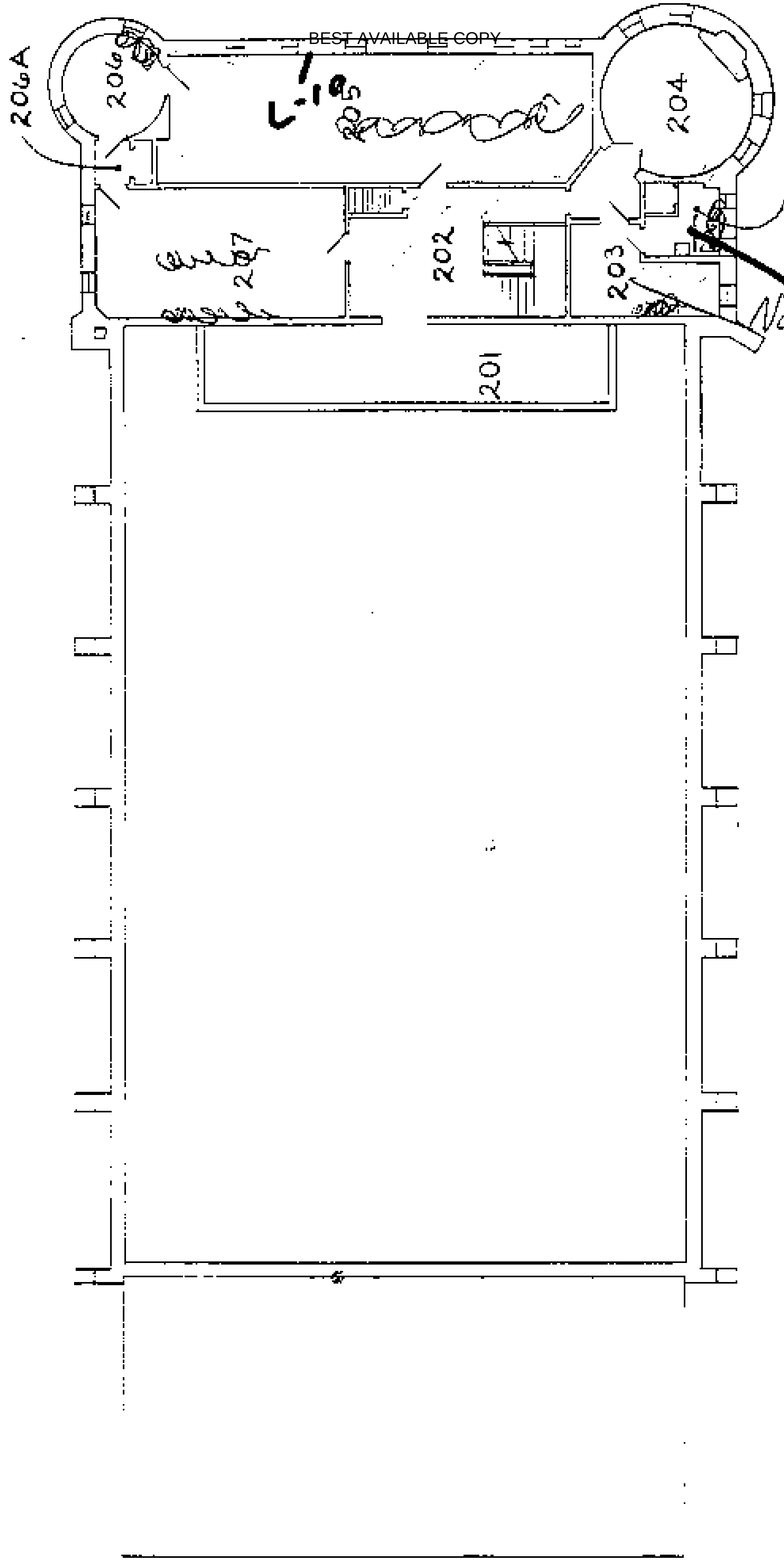

207
24.2
53.5
0
53D
26-51

24/10/95

ELKTON ARMORY
SECOND FLOOR PLAN
NO SCALE

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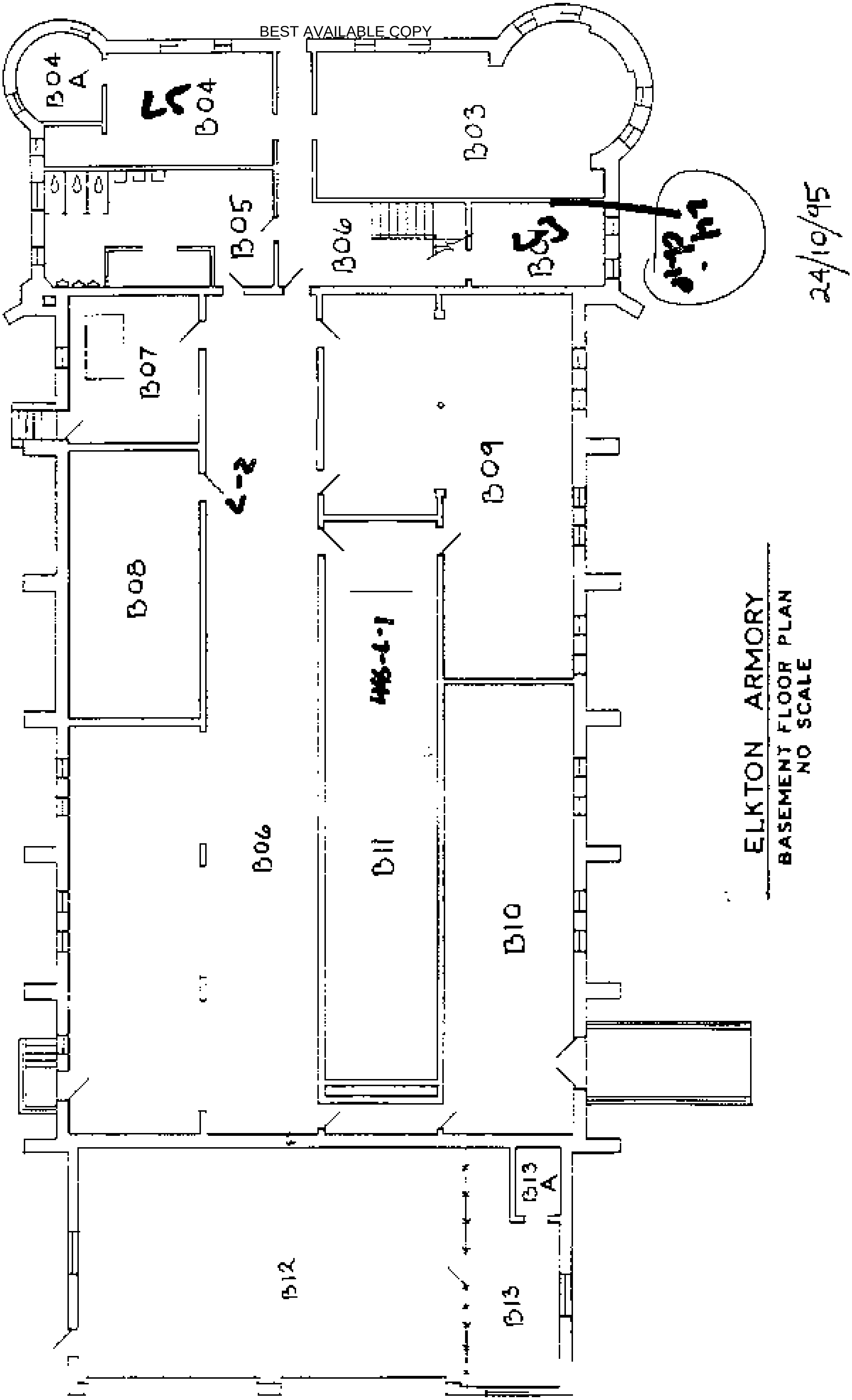

Appendix B

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:**	[redacted]

Attention: [redacted]

Page 1 of 2

AMA Sample #	Client Sample #	Analysis and Sample Type	Turn Around	Cost	Additional Analysis and Sample Type *	Turn Around *	Additional Cost *	Total Cost
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.

Note: All Accounts over 30 days are subject to a 1½% per month service charge.

* Only apply if additional analysis was performed on the sample(s)

Account Code: NATLG

Remit to: P.O. Box 646, Hanover, Maryland 21076, 410-684-3327

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May, 2018

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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:**	[redacted]

Attention: [redacted]

AMA Sample #	Client Sample #	Analysis and Sample Type	Turn Around	Cost	Additional Analysis and Sample Type *	Turn Around *	Additional Cost *	Total Cost

Sub-Total:	**$286.00**
Additional Charge:	**$0.00**
Total:	**$286.00**

Note: Payment Due Upon Receipt.

Note: All Accounts over 30 days are subject to a 1½% per month service charge.

* Only apply if additional analysis was performed on the sample(s)

Account Code: NATLG

Remit to: P.O. Box 646, Hanover, Maryland 21076, 410-684-3327

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA ACCREDITED LABORATORY Environmental Lead See aihalap.org for details 100470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	RC #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:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	9/9/2008
				Report Date:	9/9/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments
0882197	495-1	Flame	Air	1410	N/A	2.13 ug/m³	< 2.1 ug/m³	
0882198	495-5	Flame	Air Blank	0	N/A	3.00 ug/m³	< 3 ug	
0882199	495-3	Flame	Air	1343	N/A	2.23 ug/m³	< 2.2 ug/m³	
0882200	495-L-4	Flame	Paint Chip	****	N/A	0.01 %Pb	0.11 %Pb	
0882201	495-L-6	Flame	Paint Chip	****	N/A	0.01 %Pb	0.97 %Pb	
0882202	495-L-7	Flame	Paint Chip	****	N/A	0.01 %Pb	0.19 %Pb	
0882203	495-L-10	Flame	Paint Chip	****	N/A	0.01 %Pb	0.098 %Pb	
0882204	495-L-11	Flame	Paint Chip	****	N/A	0.01 %Pb	4.5 %Pb	
0882205	495-L-1	Flame	Wipe	****	0.108	111.52 ug/ft²	< 110 ug/ft²	
0882206	495-L-2	Flame	Wipe	****	0.108	111.52 ug/ft²	130 ug/ft²	
0882207	495-L-3	Flame	Wipe	****	0.108	111.52 ug/ft²	470 ug/ft²	
0882208	495-L-5	Flame	Wipe	****	0.108	111.52 ug/ft²	3200 ug/ft²	
0882209	495-L-8	Flame	Wipe	****	0.108	111.52 ug/ft²	< 110 ug/ft²	
0882210	495-L-9	Flame	Wipe	****	0.108	111.52 ug/ft²	< 110 ug/ft²	
0882211	495-L-12	Flame	Wipe Blank	****	N/A	12.00 ug	< 12 ug	

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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May, 2018

AMA Analytical Services, Inc.
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CERTIFICATE OF ANALYSIS

AIHA Environmental Lead 100470
NY ELAP 10920

Client: National Guard Bureau
Address: 301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation
Havre de Grace, Maryland 21078
Attention: [redacted]

Job Name: RC #495: Elkton, MD
Job Location: Not Provided
Job Number: Not Provided
P.O. Number: Not Provided

Chain Of Custody: 181430
Date Submitted: 9/7/2008
Person Submitting: [redacted]
Date Analyzed: 9/9/2008 **Report Date:** 9/9/2008

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.
Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accrediation applies only to paint chip, wipe, and water samples.

Analyst: Melissa Sampson

Technical Manager: G Edward Carney

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QC Summary

Sample Delivery Group: 16553

Analysis Type:	Flame
Sample Type	Air
Analysis Date:	9/9/2008

	Result		Percent Recovery	RPD	Comment
Preparation Blank	-0.021	ppm			Acceptable
Report Limit Verification Sample	0.2096	ppm	83.8%		Acceptable
Expected Spike Level (ppm) 0.25					
Duplicate Sample 1	#Num!	mg/Kg			
Duplicate Sample 2	#Num!	mg/Kg		#Error	#Error
Matrix Spike Analysis					
Spiked Sample			104.24%		Acceptable
Spike Duplicate			104.69%	0.43%	Acceptable
Laboratory Control Sample 1	133.054	µg	103.51%		Acceptable
Laboratory Control Sample 2	126.233	µg	103.92%	0.39%	Acceptable

Calibration Information

Correlation of Calibration Curve 0.999875

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181397	81899	486-1
181397	81900	486-2

SDG Number: 16553

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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
181430	82197	495-1
181430	82198	495-5
181430	82199	495-3
182583	82391	LOC-104
182583	82392	LOC-105
182583	82393	LOC-106
182583	82394	LOC-107
182583	82395	LOC-108
182583	82396	LOC-109

SDG Number: 16553

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AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 16552

Analysis Type:	Flame
Sample Type:	Paint Chip
Analysis Date:	9/8/2008

	Result		Percent Recovery	RPD	Comment
Preparation Blank	-0.031	ppm			Acceptable
Report Limit Verification Sample	0.3418	ppm	102.6%		Acceptable
Expected Spike Level (ppm) 0.3333					
Duplicate Sample 1	9723	mg/Kg			
Duplicate Sample 2	8821	mg/Kg		9.73%	Acceptable
Matrix Spike Analysis					
Spiked Sample			92.45%		Acceptable
Spike Duplicate			94.00%	1.66%	Acceptable
Laboratory Control Sample 1	528.377	µg	110.78%		Acceptable
Laboratory Control Sample 2	429.110	µg	94.52%	15.84%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999853

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181397	81909	486-11
181397	81910	486-12

SDG Number: 16552

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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181397	81911	486-13
181397	81912	486-14
181430	82200	495-L-4
181430	82201	495-L-6
181430	82202	495-L-7
181430	82203	495-L-10
181430	82204	495-L-11
181404	82235	487-7
181404	82236	487-9
181404	82237	487-10
181417	82254	C1
181417	82255	C2
176586	82328	CBC080908-10
176586	82329	CBC080908-11

SDG Number: 16552

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AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 16550

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	9/9/2008

		Result		Percent Recovery	RPD	Comment
Preparation Blank		-0.051	ppm			Acceptable
Report Limit Verification Sample		0.302	ppm	90.6%		Acceptable
Expected Spike Level (ppm)	0.3333					
Duplicate Sample 1		#Num!	mg/Kg			
Duplicate Sample 2		#Num!	mg/Kg		#Error	#Error
Matrix Spike Analysis						
Spiked Sample				93.21%		Acceptable
Spike Duplicate						Acceptable
Laboratory Control Sample 1		304.012	µg	99.98%		Acceptable
Laboratory Control Sample 2		291.358	µg	100.69%	0.71%	Acceptable

Calibration Information

Correlation of Calibration Curve 0.999884

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
181430	82205	495-L-1
181430	82206	495-L-2

SDG Number: 16550

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181430	82207	495-L-3
181430	82208	495-L-5
181430	82209	495-L-8
181430	82210	495-L-9
181430	82211	495-L-12
181417	82248	W1
181417	82249	W2
181417	82250	W3
181417	82251	W4
181417	82252	W5
181417	82253	W6

SDG Number: 16550

AMA Analytical Services, Inc.

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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:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	Not Provided	**Date Analyzed:**	9/9/2008
				Report Date:	9/10/2008

AMA Sample #	0882212	0882213
Client ID	M-495-3	M-495-4
Analyst ID	TLW	TLW
Collection Apparatus	Allergenco	Allergenco
Sample Volume (L)	75	75
Analytical Sensitivity (sp/m³)	55	55
Sample Condition	Acceptable	Acceptable

	Raw CT.	%	sp/m³	Raw CT.	%	sp/m³
Alternaria						
Ascospores	2	5.0%	110	2	5.9%	110
Aureobasidium						
Basidiospores	18	45.0%	991	8	23.5%	441
Bipolaris/Drechslera/Helm.				1	2.9%	55
Boletus						
Botrytis						
Cercospora						
Chaetomium						
Cladosporium	2	5.0%	110	8	23.5%	441
Coprinus						
Curvularia						
Epicoccum						
Fusarium						
Ganoderma						
Nigrospora						
Penicillium / Aspergillus	4	10.0%	220	5	14.7%	275
Pithomyces				Present		< 55
Rusts						
Smuts/Periconia/Myxomycetes	2	5.0%	110	4	11.8%	220
Stachybotrys						
Stemphylium						
Trichoderma						
Torula						
Ulocladium						
Zygomycetes						
Other Colorless	12	30.0%	661	6	17.6%	330
Unknown						
Hyphal Fragments*				Present		< 55
Trichocladium				Present		< 55
Totals Spore Concentration			2,200			1,870
Location	B03			103		
Comments						

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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 [redacted]
Attention:	Non-Responsive [redacted]	**P.O. Number:**	Not Provided	**Date Analyzed:**	9/9/2008
				Report Date:	9/10/2008

AMA Sample #	0882214	**AMA Sample #**	0882215
Client ID	M-495-5	**Client ID**	M-495-6
Analyst ID	TLW	**Analyst ID**	TLW
Collection Apparatus	Allergenco	**Collection Apparatus**	Allergenco
Sample Volume (L)	75	**Sample Volume (L)**	75
Analytical Sensitivity (sp/m³)	55	**Analytical Sensitivity (sp/m³)**	55
Sample Condition	Acceptable	**Sample Condition**	Acceptable

	Raw CT.	%	sp/m³		Raw CT.	%	sp/m³
Alternaria				**Alternaria**	2	0.7%	110
Ascospores	2	10.0%	110	**Ascospores**	63	21.6%	3,470
Aureobasidium				**Aureobasidium**			
Basidiospores	3	15.0%	165	**Basidiospores**	46	15.8%	2,530
Bipolaris/Drechslera/Helm.				**Bipolaris/Drechslera/Helm.**	Present		< 55
Boletus				**Boletus**			
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
Fusarium				**Fusarium**			
Ganoderma				**Ganoderma**			
Nigrospora				**Nigrospora**	Present		< 55
Penicillium / Aspergillus	2	10.0%	110	**Penicillium / Aspergillus**	17	5.8%	936
Pithomyces	Present		< 55	**Pithomyces**	Present		< 55
Rusts	1	5.0%	55	**Rusts**			
Smuts/Periconia/Myxomycetes	2	10.0%	110	**Smuts/Periconia/Myxomycetes**	13	4.5%	716
Stachybotrys				**Stachybotrys**			
Stemphylium				**Stemphylium**			
Trichoderma				**Trichoderma**			
Torula				**Torula**	Present		< 55
Ulocladium				**Ulocladium**			
Zygomycetes				**Zygomycetes**			
Other Colorless	8	40.0%	441	**Other Colorless**	13	4.5%	716
Unknown				**Unknown**			
Hyphal Fragments*				**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:**	[redacted]
Attention:	[redacted]	**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^3concentration will be reported as less than the analytical sensitivity if "Present" is reported in the Raw Count.

Due to rounding, totals may not equal 100%

sp/m^3: Spores per cubic meter.

Results are reported to 3 significant figures.

Analyst Tristan Ward

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.

A Specialized Environmental Laboratory

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:**	[redacted]
Attention:	[redacted]	**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		
Bip/Dresch/Helm		
Boletus		
Botrytis		
Cercospora		
Chaetomium		
Cladosporium	81,000	Moderate
Coprinus		
Curvularia		
Epicoccum		
Fusarium		
Ganoderma		
Nigrospora		
Pen/Asp Like		
Pithomyces		
Rusts		
Smuts/Peri/Myx		
Stachybotrys		
Stemphylium		
Trichoderma		
Torula		
Ulocladium		
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 [redacted]
Attention:	Non-Responsive [redacted]	**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/in²: Spores per inch squared.

Results are reported to 3 significant figures.

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.

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA Accredited Laboratory — Industrial Hygiene — See aihaiqap.org for details — 100470

NY ELAP 10920

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:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	9/9/2008 **Report Date:** 9/10/2008

Attention: [redacted]

Summary of Phase Contrast Microscopy

Page 1 of 1

AMA Sample Number	Client Sample Number	Volume Sampled (Liters)	Fibers Per Millimeter Squared	Fibers Per Cubic Centimeter	Analyst I.D.	Sample Type	Comments
0882195	495-4	0	< 7.0 *	*****	CK	N/P	
0882196	495-2	1049.43	8.3	0.007	CK	N/P	

* The Reporting Limit for AMA Laboratory is 7.0 fibers per square millimeter of filter. The reporting limit for the air concentration of fibers (f/cc) is dependent on the sampled air volume. Fibers counts were determined by the methods described in NIOSH Analytical Method 7400, 'Fibers' (Revision 3, Issue 2, 8/15/94). All personnel samples were analyzed following the OSHA Reference Method.

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.

Uncertainty: for fibers/mm^2 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

Analyst: Crystal Kellam

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EI

181430

SAMPLE CHAIN OF CUSTODY

DATE SHIPPED	# OF SAMPLES	SAMPLE MEDIA TYPE	PROJECT NAME
	22		Elkton: MD NG
CONTACT			TELEPHONE NUMBER
[redacted]			

SAMPLE # OR AREA	SAMPLE DATE	SAMPLE VOLUME	ANALYSIS REQUESTED
495-1	8/7/08	1409.88	Air: Lead
495-~~1~~5	↓	0	↓
495-3		1342.59	↓
495-4		0	Air: Asb
495-2		1049.43	↓
M-495-3 (B03)		750 L	Air: Fungal Spore
M-495-4 (103)		↓	↓
M-495-5 (207)			
M-495-6 (Out)		↓	↓
495-3A (B03)		—	Surface: Fungal spore
495-L-4 (B01)		—	Lead: Chips
495-L-6 (101)		—	↓
495-L-7 (102)		—	
495-L-10 (205A)		—	
495-L-11 (203A)	↓	—	↓

Samples Relinquished By:	Signature [signature]	Date 8/7/08
Samples Received By:	Signature	Date
Samples Analyzed By:	Signature	Date

1/2

EI

181430

SAMPLE CHAIN OF CUSTODY

DATE SHIPPED	# OF SAMPLES	SAMPLE MEDIA TYPE	PROJECT NAME
			Elkton: MD NG

CONTACT	TELEPHONE NUMBER
Non-Responsive [redacted]	

SAMPLE # OR AREA	SAMPLE DATE	SAMPLE VOLUME	ANALYSIS REQUESTED
495-L-1 (B-11 R)	8/7/08	100 cm²	Lead: wipe
495-L-2 (B-08 V)	↓	↓	↓
495-L-3 (B01)	↓	↓	↓
495-L-5 (B04 K)	↓	↓	↓
495-L-8 (107)	↓	↓	↓
495-L-9 (203 A)	↓	↓	↓
495-L-12 (Blank)	↓	↓	↓

Samples Relinquished By:	Signature	Date 8/12/08
Samples Received By:	Signature	Date
Samples Analyzed By:	Signature	Date

2/2

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AMA Analytical Services, Inc.
Focused on Results
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 181430

Mailing/Billing Information:
1. Client Name: National Guard Bureau NE
2. Address 1: 301-1H Old Bay Lane
3. Address 2: Havre de Grace, Maryland 21078
4. Address 3: ______
5. Phone #: 336 455 2558 Fax #: 704 593 1650

Submittial Information:
1. Job Name: RC # 495: Elkton, MD
2. Job Location: ______
3. Job #: ______ P.O. #: ______
4. Contact Person: ______ @ phone # 336 455 2558
5. Submitted by [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ______ ☐ 24 Hours Time Due: ______ Comments: ______	☐ Immediate ☐ 3 Day ☐ Next Day ☒ 5 Day + ☐ 2 Day Date Due: 9/11/08 ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☐ Includ[redacted]a Sheets with Report ☒ Email [redacted] @ ei1.com ☐ Fax: ______ ☐ Verbals: ______

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity ______ in a 25mm 37mm
☒ NIOSH 7400 2 (QTY)
☐ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity ______ in a 25mm 37mm
☐ AHERA ______ (QTY)
☐ NIOSH 7402 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ______ (QTY)
☐ EPA Point Count ______ (QTY)
☐ NY State Friable 198.1 ______ (QTY)
☐ Grav. Reduction ELAP 198.6 ______ (QTY)
☐ Other (specify ______) ______ (QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ______ (QTY)
☐ NY State PLM/TEM ______ (QTY)
☐ Residual Ash ______ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
☐ Quan. (s/area)Dust D6480-99 ______ (QTY)
TEM Water
☐ Qual. (pres/abs) ______ (QTY)
☐ ELAP 198.2/EPA 100.2 ______ (QTY)
☐ EPA 100.1 ______ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ______ °C)

Lead Analysis
☒ Paint Chip 5 (QTY)
☒ Dust Wipe (wipe type ______) 7 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid ______ (QTY)
☐ TCLP ______ (QTY)
☐ Drinking Water ______ (QTY)
☐ Waste Water ______ (QTY)
☐ Dust Wipe Furnace (wipe type ______) ______ (QTY)

Mold - Direct Microscopic Analysis
☐ Collection Apparatus for Spore Traps: ______
☒ Spore-Trap 4 (QTY) ☐ Bulk ______ (QTY)
☐ Surface Swab ______ (QTY) ☐ Surface Vacuum Dust ______ (QTY)
☒ Surface Tape 1 (QTY) ☐ Other (Specify ______) ______ (QTY)

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
	See Attached 2 pages																Date/Time: Contact: By:
																	Date/Time: Contact: By:
																	Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 9 / 4 / 08 @ 800 Via: UPS By (Print): M Sampson Sign: [signature]
2. Date/Time Analyzed: ___ / ___ / ___ @ ___ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ___ / ___ / ___ Time: ______ Initials: ______
4. Comments: ______

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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-IH 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 [redacted]

Director, Environmental Health & Safety

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May, 2018
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Table of Contents

Section 1.0
Executive Summary

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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. Non-Responsive [redacted]

1. Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft^2 in attached garage on top of the locker. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2.

2. Employees were not performing tasks that provided excessive noise levels. 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.

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Section 2.0
Operation Description & Observations

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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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Section 3.0 Noise Survey

Employees were not performing tasks that provided excessive noise levels. Therefore noise exposure monitoring was not conducted.

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Section 4.0
Lead Testing

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Section 4.0 Lead Testing

At the time of the assessment, no activities were observed which would generate lead exposure. Soldiers reportedly clean rifles 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 Wipe™ samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 um mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2	Paint Chip %Pb
1	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		<110	
9	Room B09 – Top of Typewriter Table		<110	
10	Kitchen Room B04 – Top of Table with Microwave		<110	
11	**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	
18	Blank		<12 ug	
19	Boiler Room – Ceiling			0.051
Criteria		**50**	**200**	**0.5**

Key: **Bolded** results exceed listed criteria

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/ft^2 as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for Environmental Chemicals," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 ug/m^3. In fact, no detectable level of lead was identified in the air sample collected.

Deteriorated paint was observed at various locations throughout the facility. Delaminated paint was mostly due to age along with prolonged exposure to elevated relative humidity levels. A paint chip sample was collected from the 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.

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Section 5.0
Lighting

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Section 5.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. K070003). The light meter was last calibrated on November 26, 2009. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	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	Yes
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

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.

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 instrument was factory calibrated in March 2010.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2007). ASHRAE specifies temperature and relative humidity ranges for human comfort (ASHRAE 55-2004). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60% in occupied areas.

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 71.2 to 89 degrees F with relative humidity readings ranging from 41.8% to 76.4%. During the survey, carbon dioxide (CO_2) levels ranged from 415 ppm to 831 ppm within the facility compared to an average outdoor CO_2 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 + 700 ppm). The following table summarizes the measurements collected.

IAQ Assessment Summary

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	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	50.1	816	0.0
B09 Supply Room	74.7	53.1	831	0.0
B11	74.5	50.5	651	0.0
Lounge/Conference Room	71.2	51.6	621	0.0
B04	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

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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:

    - Drill Hall;
    - Room 108;
    - Room 205;
    - Room 207;
    - Room 203;
    - Room B09;
    - Lounge;
    - 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.

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Section 7.0
Suspect Asbestos Containing Building Materials

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Section 7.0 Suspect Asbestos Containing Building Materials

Suspect asbestos containing materials (ACM) 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.

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Section 8.0
Maintenance Bay

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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 seldom, 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 duct with a 5" duct diameter. The flow rate was measured and found to be 37.8 Cubic Feet per Minute (CFM) in Bay 1 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 (27th Edition).

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Section 9.0
Limitations

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Section 9.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Analytical Laboratory Services, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A
Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP 10920

Client:	National Guard Bureau	Job Name:	Elkton Armory	Chain Of Custody:	508327
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Elkton, MD	Date Submitted:	7/20/2010
	Havre de Grace, Maryland 21078	Job Number:	Elkton Armory	Person Submitting:	[redacted]
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	7/27/2010 Report Date: 7/27/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
1062036	1007445-1	Flame	Air	850	N/A	3.5	ug/m³	<3	<3.5	ug/m³	
1062037	1007445-2	Flame	Air	844	N/A	3.6	ug/m³	<3	<3.6	ug/m³	
1062038	1007445-3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
1062039	1007445-4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1062040	1007445-5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1062041	1007445-6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1062042	1007445-7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1062043	1007445-8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1062044	1007445-9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1062045	1007445-10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1062046	1007445-11	Flame	Wipe	****	0.108	110	ug/ft²	110	1100	ug/ft²	
1062047	1007445-12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1062048	1007445-13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1062049	1007445-14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1062050	1007445-15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1062051	1007445-16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1062052	1007445-17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
1062053	1007445-18	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
1062054	1007445-19	Flame	Paint Chip	****	N/A	0.01	%Pb		0.051	%Pb	

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AIHA, NVLAP, NIST, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

4475 Forbes Blvd. · Lanham, MD. 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY

NY ELAP
10920

Client:	National Guard Bureau	Job Name:	Elkton Armory	Chain Of Custody:	508327
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Elkton, MD	Date Submitted:	7/20/2010
	Havre de Grace, Maryland 21078	Job Number:	Elkton Armory	Person Submitting:	[redacted]
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	7/27/2010 Report Date: 7/27/2010
Attention:	[redacted]				

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Total ug	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)
%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accreditation applies only to paint chip, wipe, and soil samples.

Analyst: G. Carney / Nida McGarvey

Technical Manager: G Edward Carney

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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **508327**

p 1/2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Elkton Armory
2. Job Location: Elkton, MD
3. Job #: Elkton Armory P.O. #: W912K6-09-A-0003
4. Contact P[redacted] @ phone # (410) 942-0273
5. Submitted[redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day +
☐ 2 Day Date Due: 7/27/10
☐ Results Required By Noon (Every Attempt Will Be Made to Accommodate)

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ [redacted]@analyticallab.com
☐ Fax [redacted]@us.army.mil
☐ Verb[redacted]@us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ______ (QTY)
☐ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ______ (QTY)
☐ NIOSH 7402 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ______ (QTY)
☐ EPA Point Count ______ (QTY)
☐ NY State Friable 198.1 ______ (QTY)
☐ Grav. Reduction ELAP 198.6 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM __(Qual) PLM __(Quan) PLM/TEM __(Qual) PLM/TEM __(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ______ (QTY)
☐ NY State PLM/TEM ______ (QTY)
☐ Residual Ash ______ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
☐ Quan. (s/area) Dust D6480-99 ______ (QTY)
TEM Water
☐ Qual. (pres/abs) ______ (QTY)
☐ ELAP 198.2/EPA 100.2 ______ (QTY)
☐ EPA 100.1 ______ (QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples ______ °C)

Metals Analysis
☒ Pb Paint Chip 1 (QTY)
☒ Pb Dust Wipe (wipe type ghost) 15 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ______ (QTY)
☐ Pb TCLP ______ (QTY)
☐ Drinking Water ☐ Pb ___ (QTY) ☐ Cu ___ (QTY) ☐ As ___ (QTY)
☐ Waste Water ☐ Pb ___ (QTY) ☐ Cu ___ (QTY) ☐ As ___ (QTY)
☐ Pb Furnace (Media ______) ______ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media: ______
☐ Spore-Trap ______ (QTY) ☐ Surface Vacuum Dust ______ (QTY)
☐ Surface Swab ______ (QTY) ☐ Culturable ID Genus (Media ______) ______ (QTY)
☐ Surface Tape ______ (QTY) ☐ Culturable ID Species (Media ______) ______ (QTY)
☐ Other (Specify ______) ______ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	TAPE	SWAB
1007445-1	Rm B09	7/16	850					X		X				
1007445-2	Rm 102		844					X		X				
1007445-3	Blank		0					X		X				
1007445-4	RmB11 Desk			100cm²				X				X		
1007445-5	RmB11 Top of Locker							X				X		
1007445-6	RmB11 Floor							X				X		
1007445-7	Hallway Fl Outside B11							X				X		
1007445-8	Lounge-Bar							X				X		
1007445-9	B01 - Top of Counter							X				X		
1007445-10	B04 - Top of Cabinet							X				X		
1007445-11	Garage - Top of Locker							X				X		
1007445-12	Rm101 Bookshelf	↓		↓				X				X		

CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 7/20/10 @ 1:00 Via: UPS By (Print) Chris Nicodemus Sign: Chris Nic
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print) ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ___/___/___ Time: ______ Initials: ______
4. Comments: ______

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4475 Forbes Blvd. • Lanham, MD 20706
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CHAIN OF CUSTODY

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4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:

1. Job Name: Elkton Armory
2. Job Location: Elkton, MD
3. Job #: Elkton Armory P.O. #: W912K6-09-A-0003
4. Contact [redacted] @ phone # (410) 942-0273
5. Submitt[redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be prescheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ____ ☐ 24 Hours Time Due: ____ Comments: ____	☐ Immediate ☐ 3 Day ☐ Next Day ☐ 5 Day + ☐ 2 Day Date Due: ____ ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☒ Include COC/Field Data Sheets with Report ☒ Email [redacted] @ ☐ Fax [redacted] @us.army.mil ☐ Verbal @us.army.mil

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
- ☐ NIOSH 7400 ______ (QTY)
- ☐ Fiberglass ______ (QTY)

TEM Air – Please Indicate Filter Type:
- ☐ AHERA ______ (QTY)
- ☐ NIOSH 7402 ______ (QTY)
- ☐ Other (specify ______) ______ (QTY)

PLM Bulk
- ☐ EPA 600 – Visual Estimate ______ (QTY)
- ☐ EPA Point Count ______ (QTY)
- ☐ NY State Friable 198.1 ______ (QTY)
- ☐ Grav. Reduction ELAP 198.6 ______ (QTY)
- ☐ Other (specify ______) ______ (QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM ___(Qual) PLM ___(Quant) PLM/TEM ___(Qual) PLM/TEM ___(Quant)

TEM Bulk
- ☐ ELAP 198.4/Chatfield ______ (QTY)
- ☐ NY State PLM/TEM ______ (QTY)
- ☐ Residual Ash ______ (QTY)

TEM Dust
- ☐ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
- ☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
- ☐ Quan. (s/area) Dust D6480-99 ______ (QTY)

TEM Water
- ☐ Qual. (pres/abs) ______ (QTY)
- ☐ ELAP 198.2/EPA 100.2 ______ (QTY)
- ☐ EPA 100.1 ______ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ______ °C)

Metals Analysis
- ☐ Pb Paint Chip ______ (QTY)
- ☐ Pb Dust Wipe (wipe type ______) ______ (QTY)
- ☐ Pb Air ______ (QTY)
- ☐ Pb Soil/Solid ______ (QTY)
- ☐ Pb TCLP ______ (QTY)
- ☐ Drinking Water ☐ Pb ___(QTY) ☐ Cu ___(QTY) ☐ As ___(QTY)
- ☐ Waste Water ☐ Pb ___(QTY) ☐ Cu ___(QTY) ☐ As ___(QTY)
- ☐ Pb Furnace (Media ______) ______ (QTY)

Fungal Analysis

Collection Apparatus for Spore Trap/Air Samples: ______
Collection Media ______
- ☐ Spore-Trap ______ (QTY) ☐ Surface Vacuum Dust ______ (QTY)
- ☐ Surface Swab ______ (QTY) ☐ Culturable ID Genus (Media ______) ______ (QTY)
- ☐ Surface Tape ______ (QTY) ☐ Culturable ID Species (Media ______) ______ (QTY)
- ☐ Other (Specify ______) ______ (QTY)

CLIENT ID. NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WIPE AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
1007445-13	Rm103 TV Shelf	7/16		100cm²				X				X					Date/Time: Contact: By:
1007445-14	Drill Hall Stepper							X				X					
1007445-15	Drill Hall Floor							X				X					
1007445-16	Drill Hall Floor							X				X					
1007445-17	Rm204 Bookshelf							X				X					Date/Time: Contact: By:
1007445-18	Blank			0cm²				X				X					
1007445-19	Boiler Rm Ceiling							X			X						
																	Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)

1. Date/Time RCVD: ___/___/___ @ ___ Via: ______ By (Print): ______ Sign: ______
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ___/___/___ Time: ______ Initials: ______
4. Comments: ______

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Appendix B
Photographs

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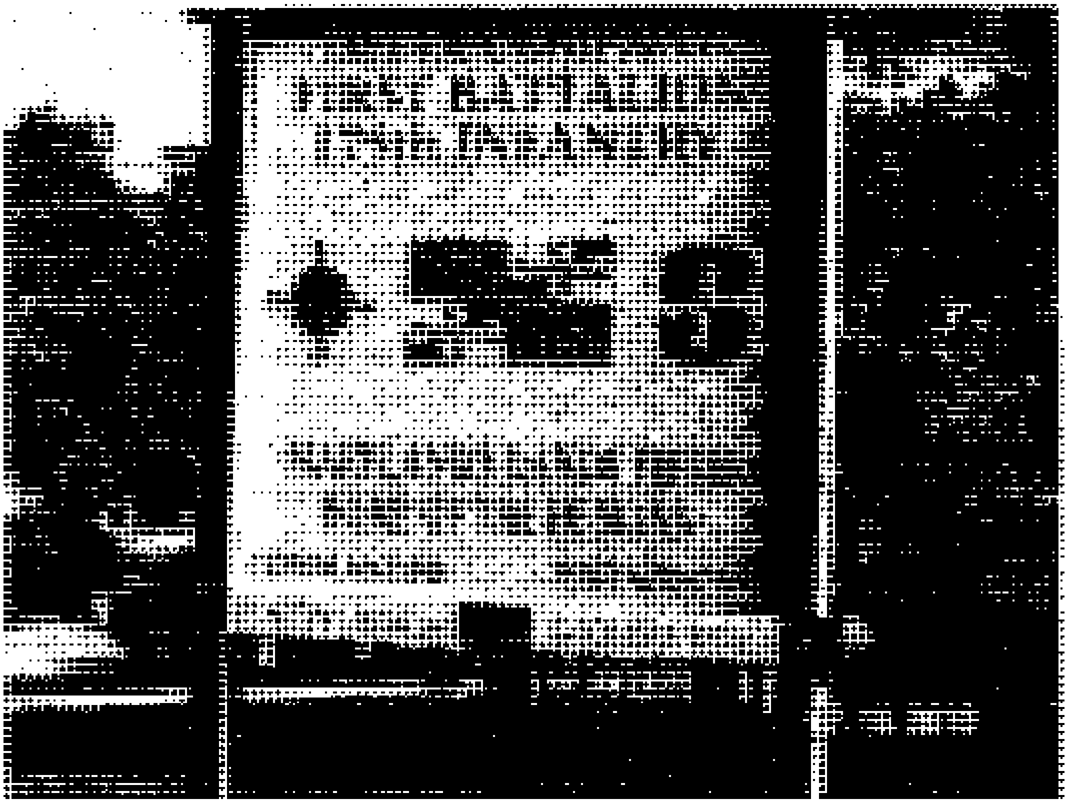

Front of building

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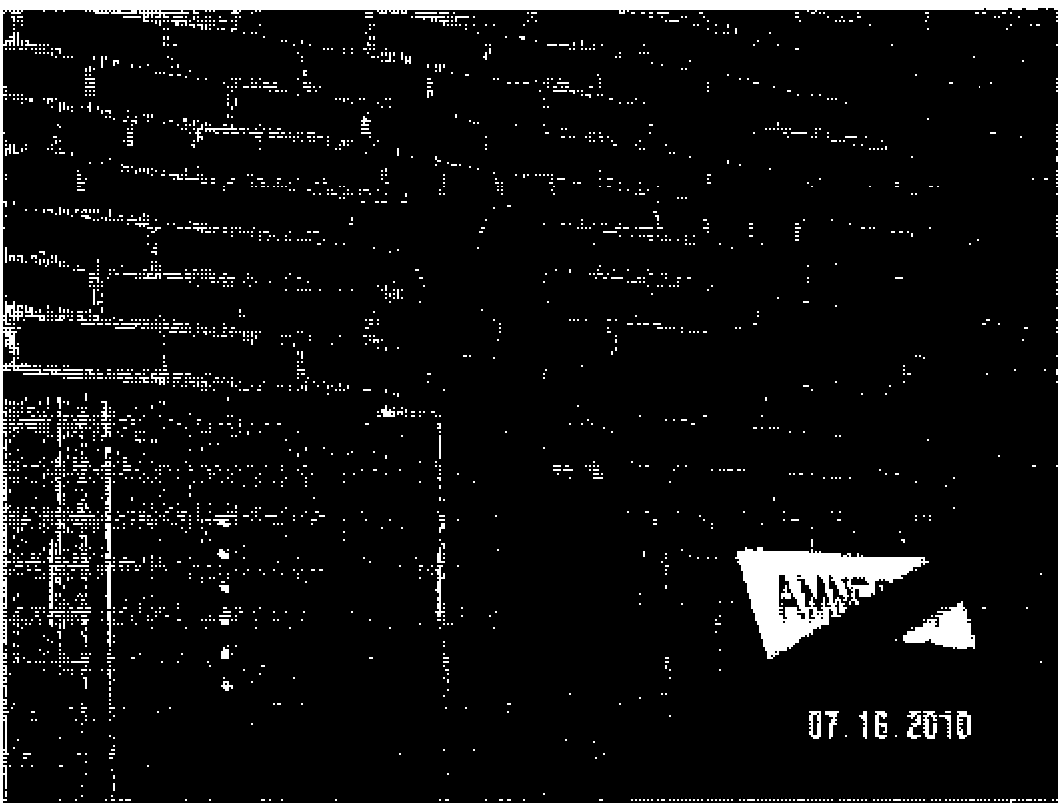
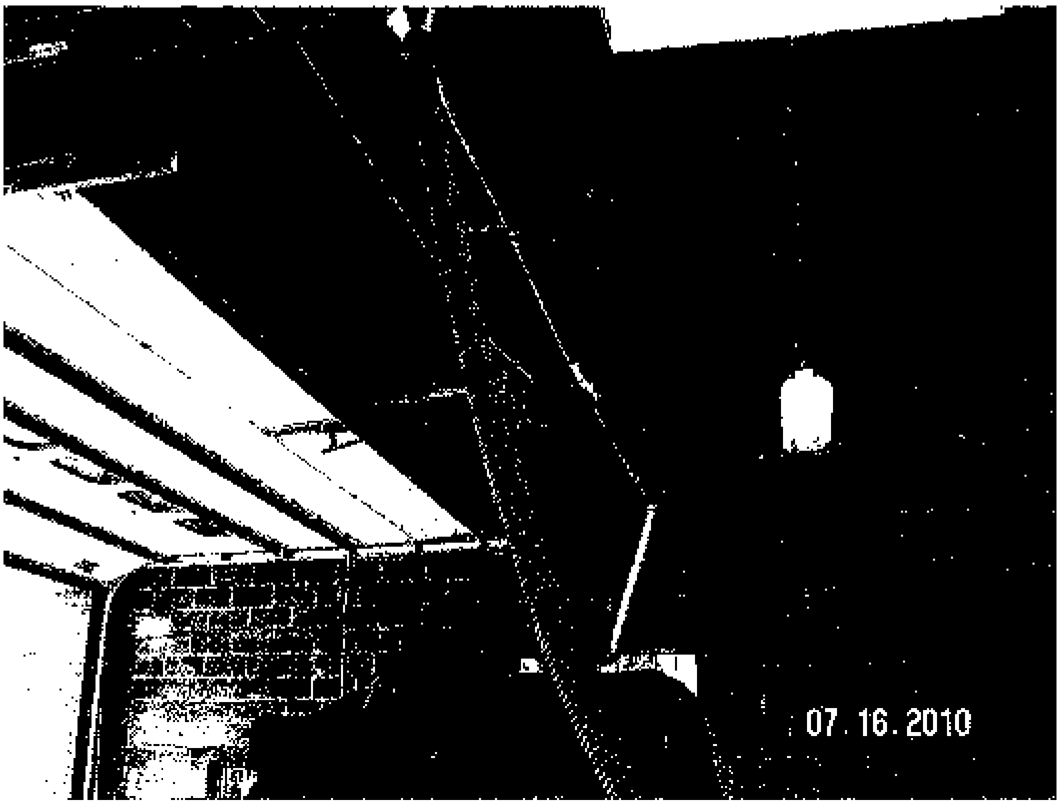
Front of maintenance building, attached garage

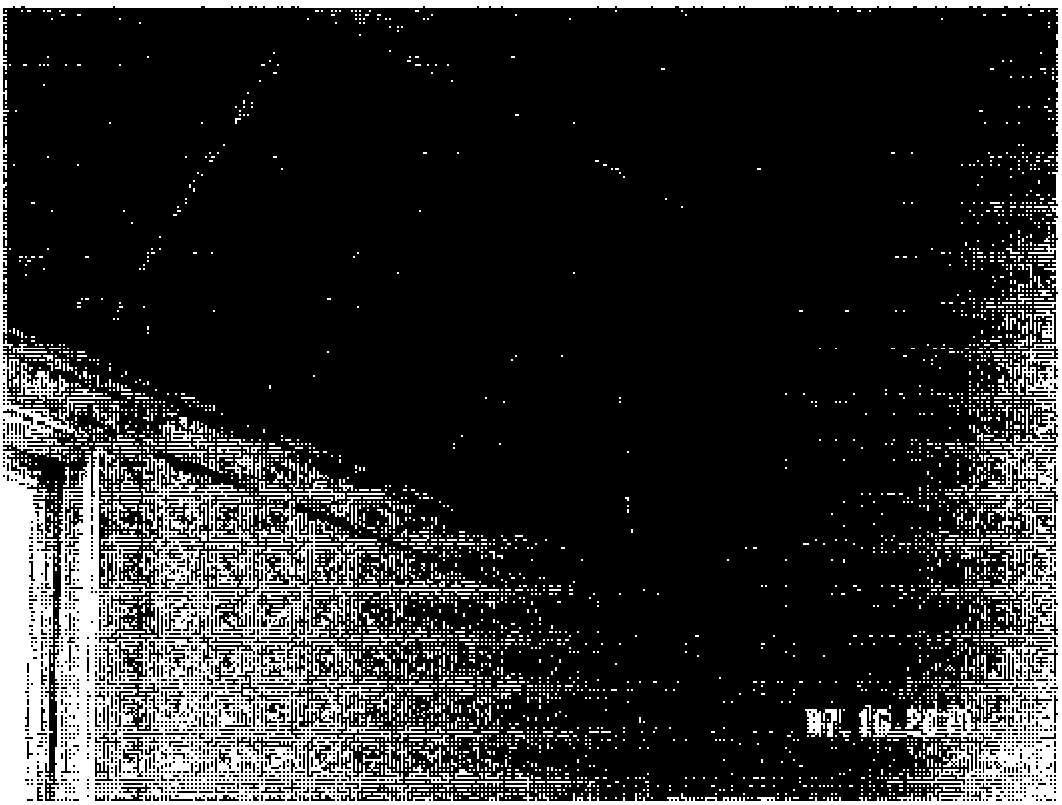


Attached garage, exhaust hose

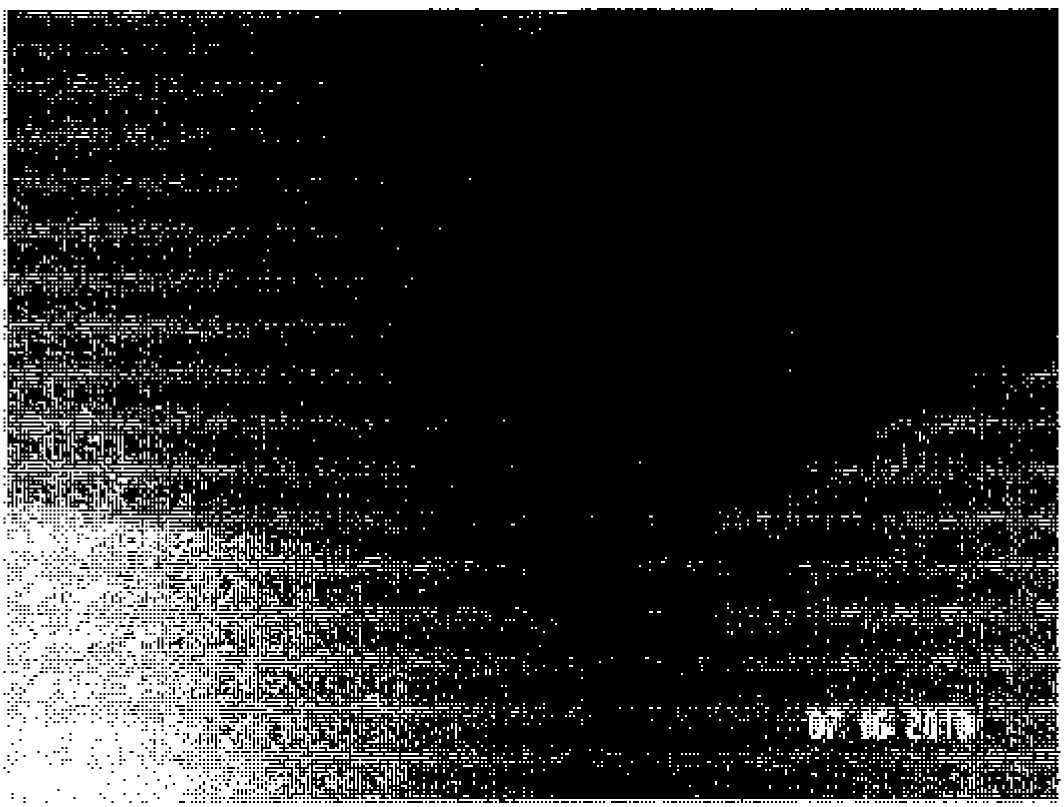


Attached garage, exhaust pipes

Attached garage, interior

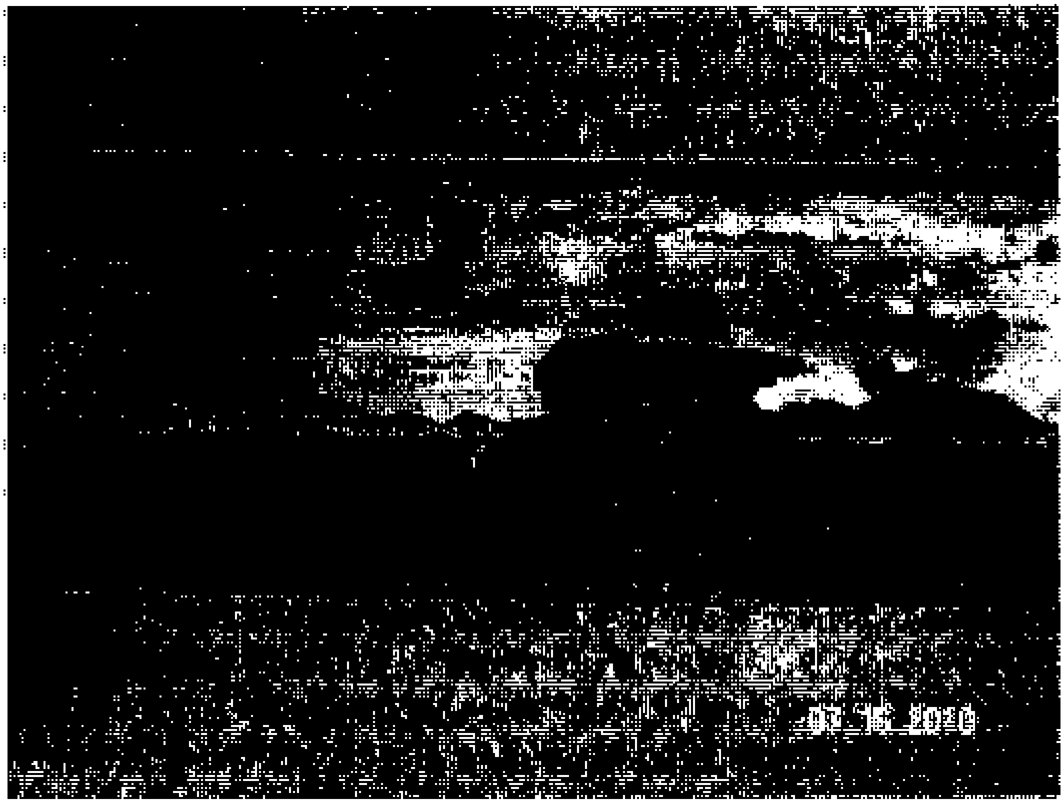


Back of Drill Hall, water / paint damage



Back of Drill Hall, water / paint damage

BEST AVAILABLE COPY



Room 102 – remaining mastic from 9" x 9" VFT

Room 107 – remaining 9" x 9" VFT

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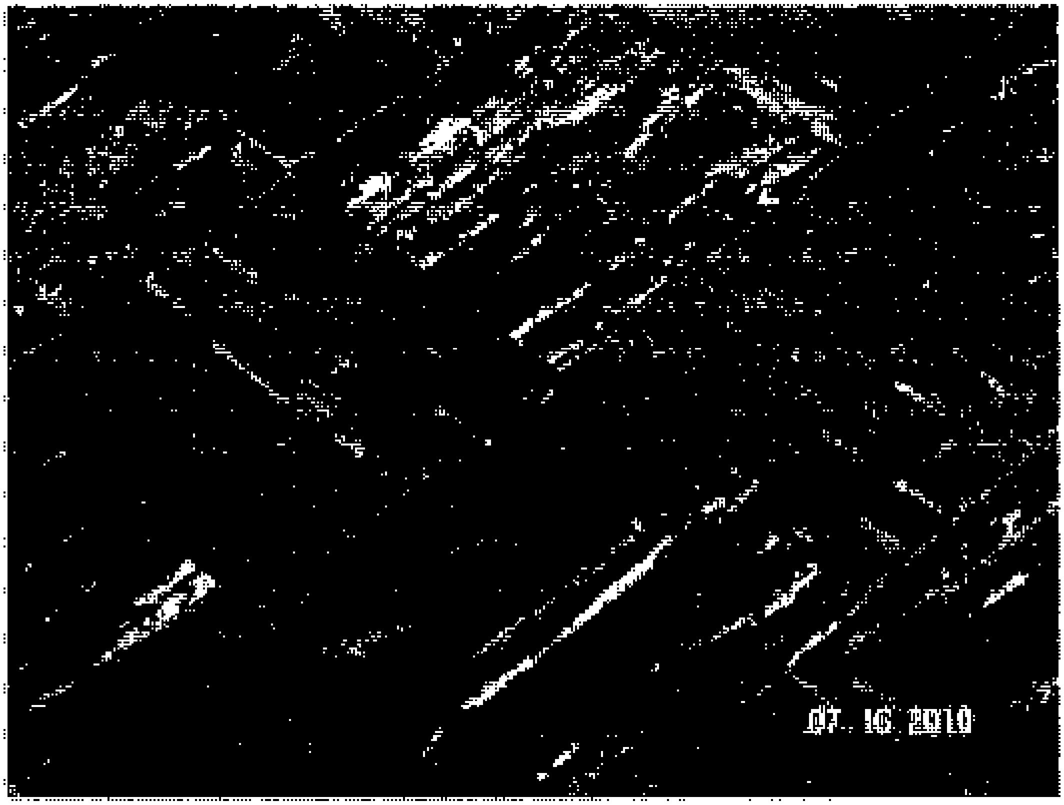
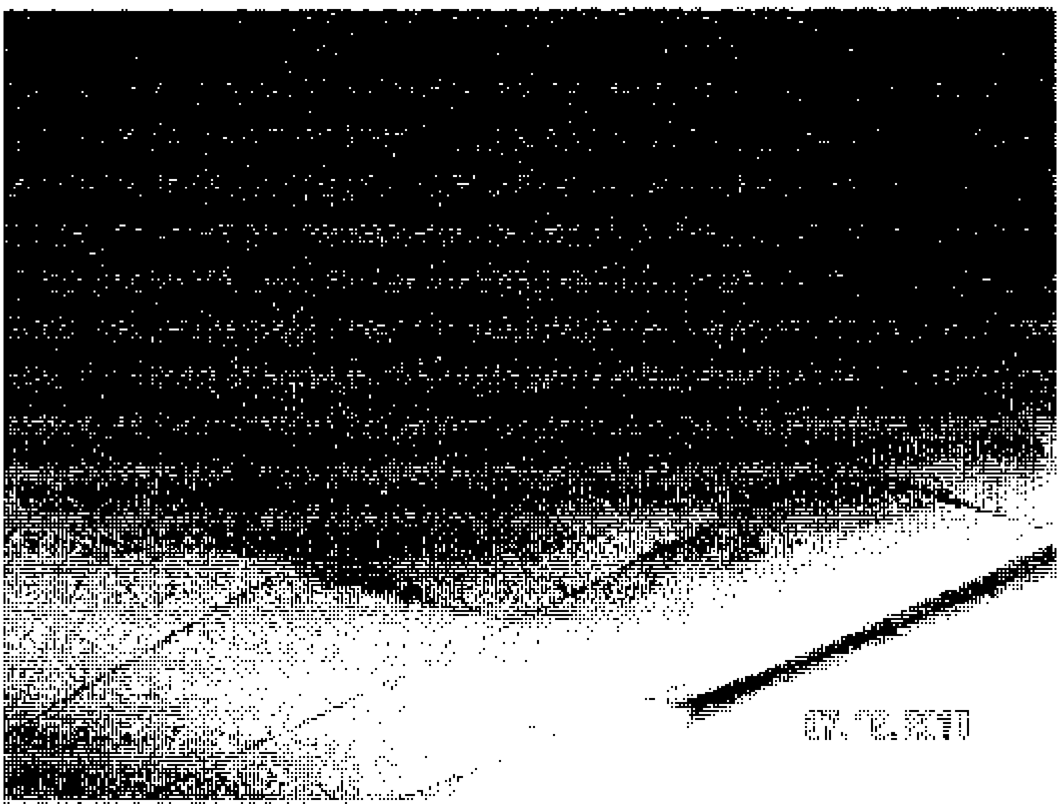
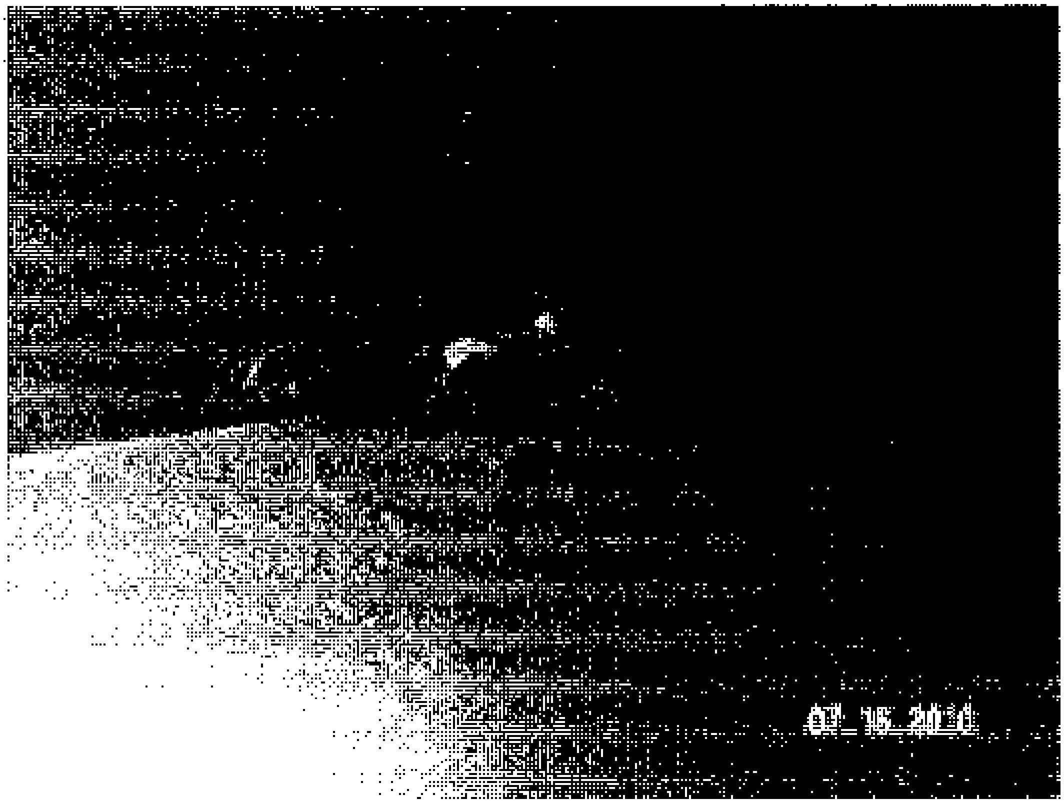


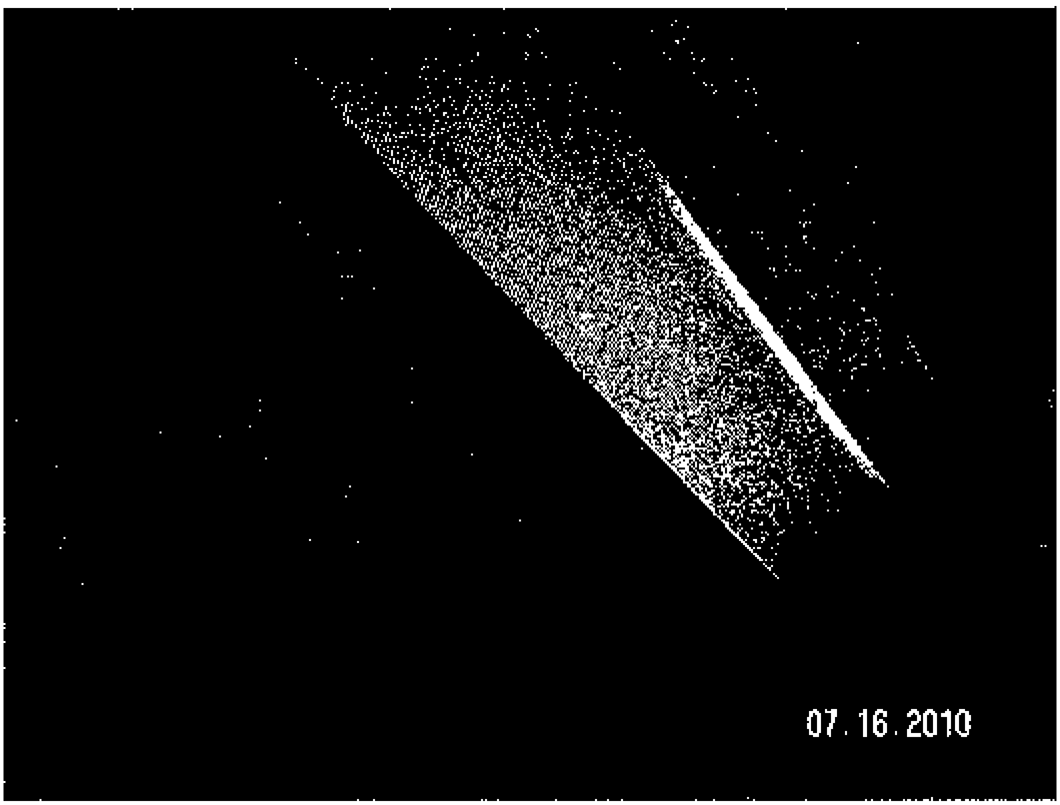
9" x 9" VFT in Rooms 201, 204, 205, and 207



Room 205 and 207, water damaged ceiling tiles



Room 203 / 203 bathroom - water damage / damaged paint on ceilings



Room 203 / 203 bathroom - water damage / damaged paint on ceilings

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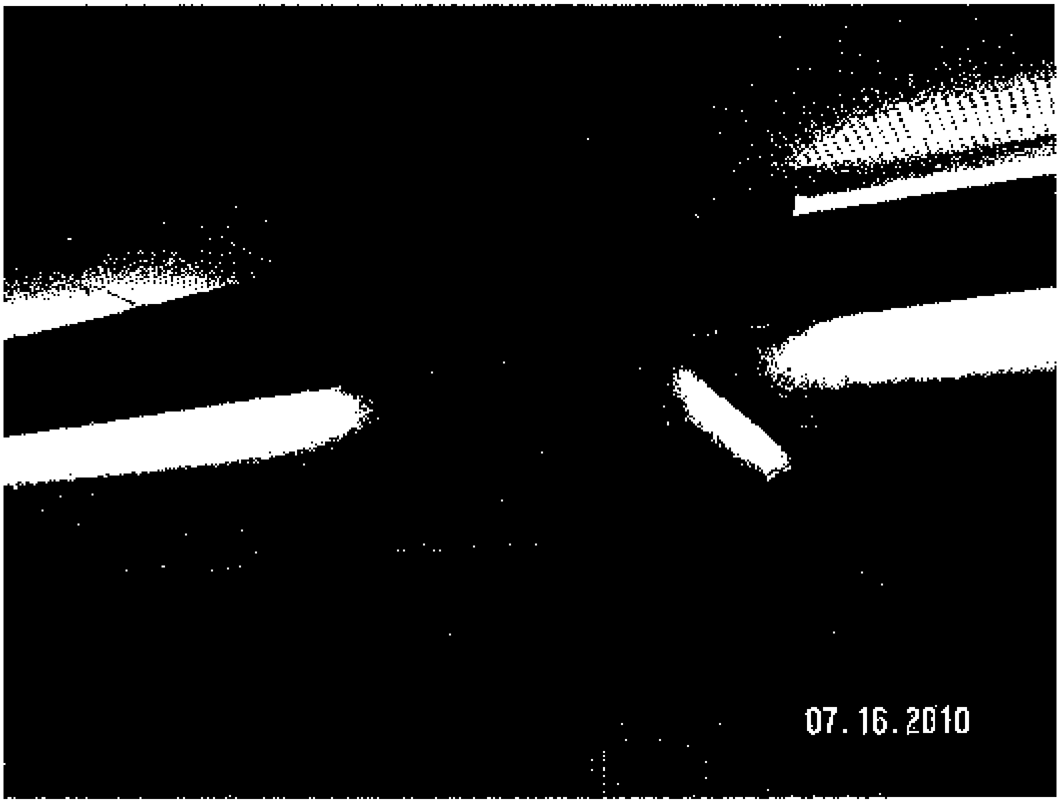
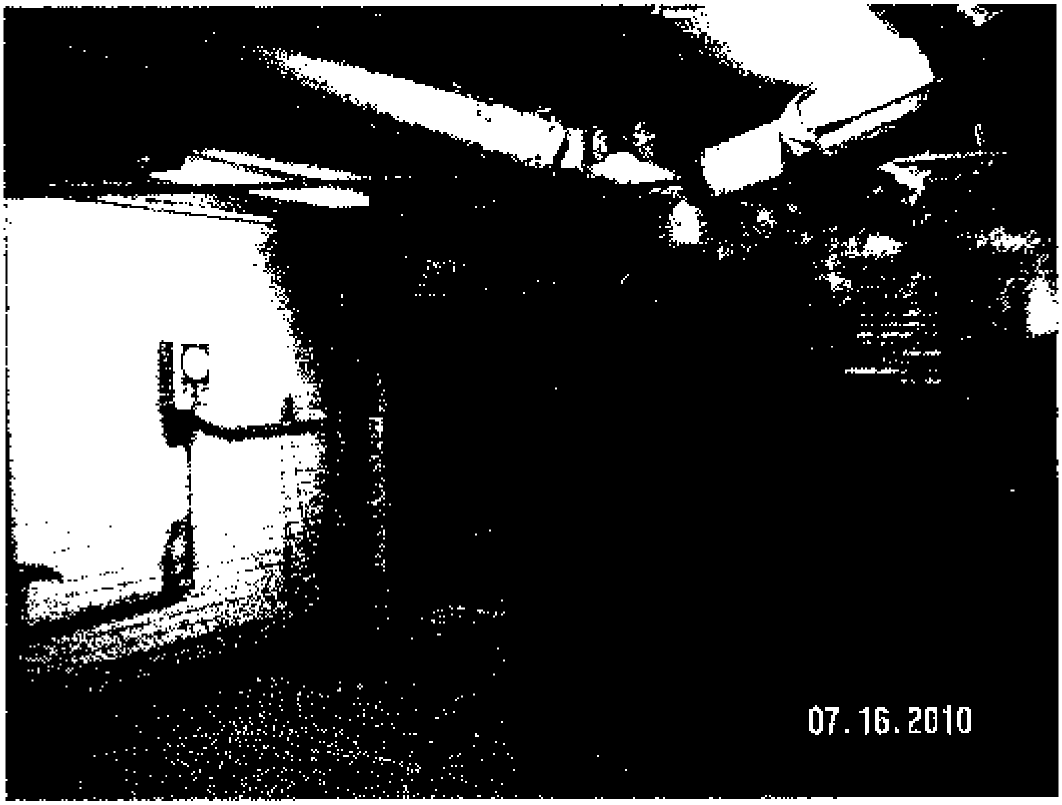


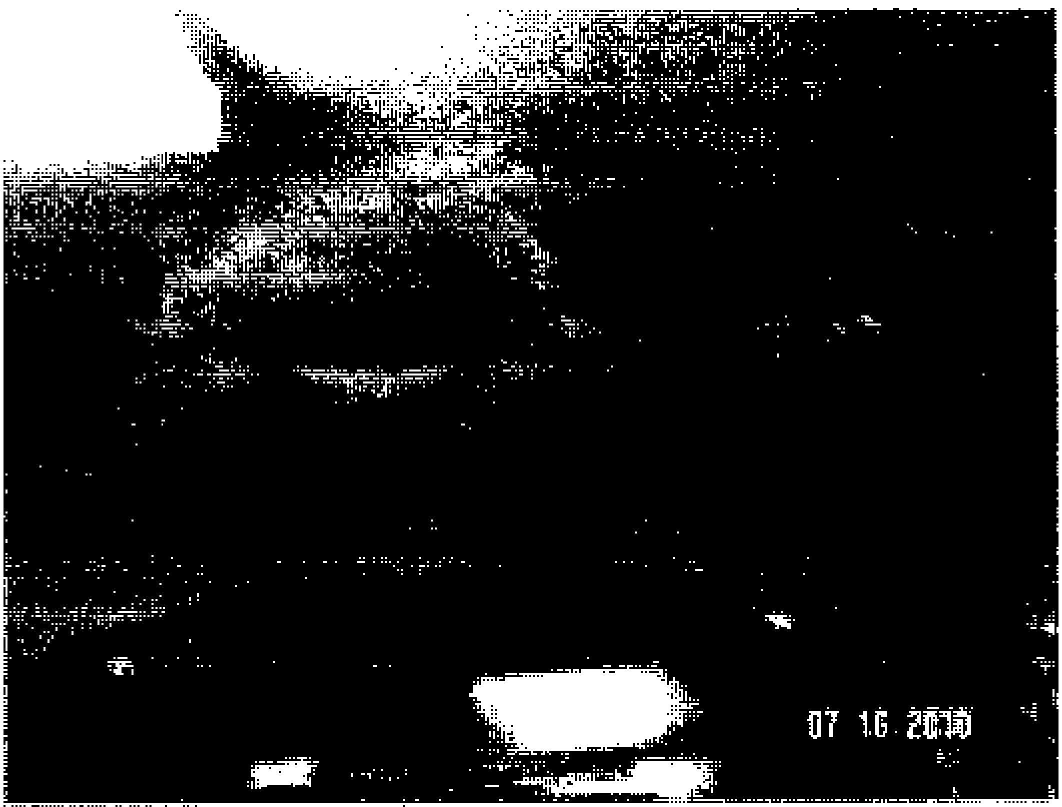
Potential ACM – pipe insulation in Room B09 and hall outside B09

Old firing range, now locker room

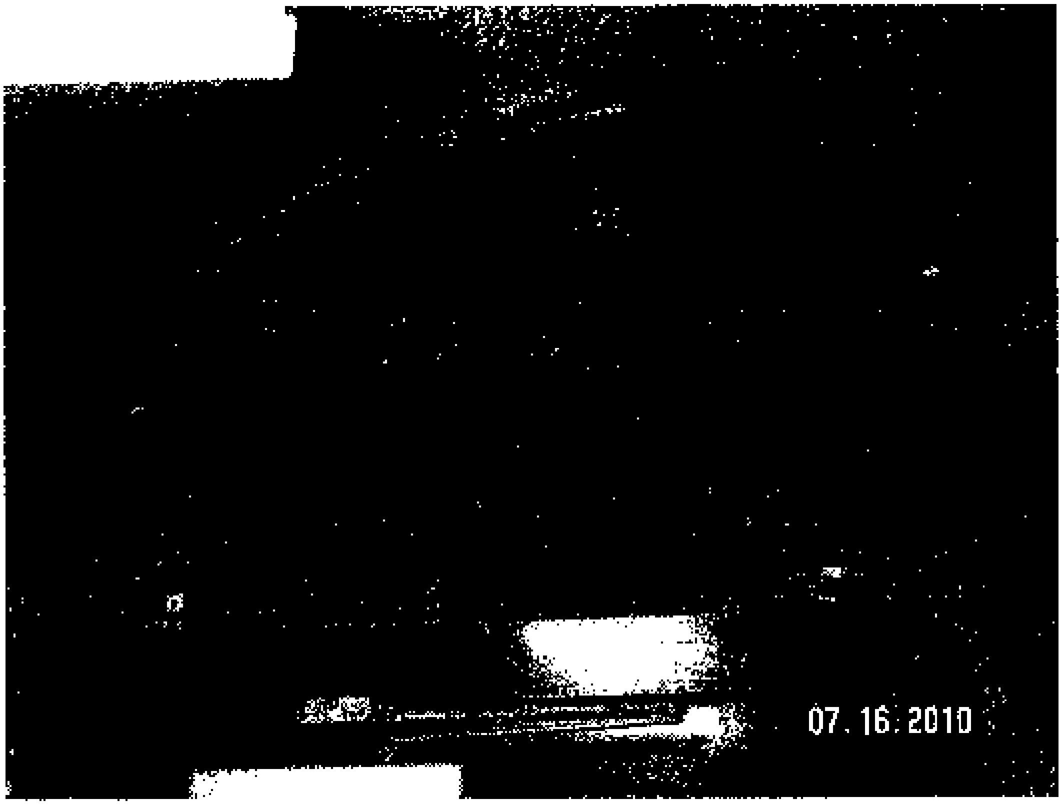
Boiler room



Boiler room



Water damage / damaged paint, back left corner of boiler room

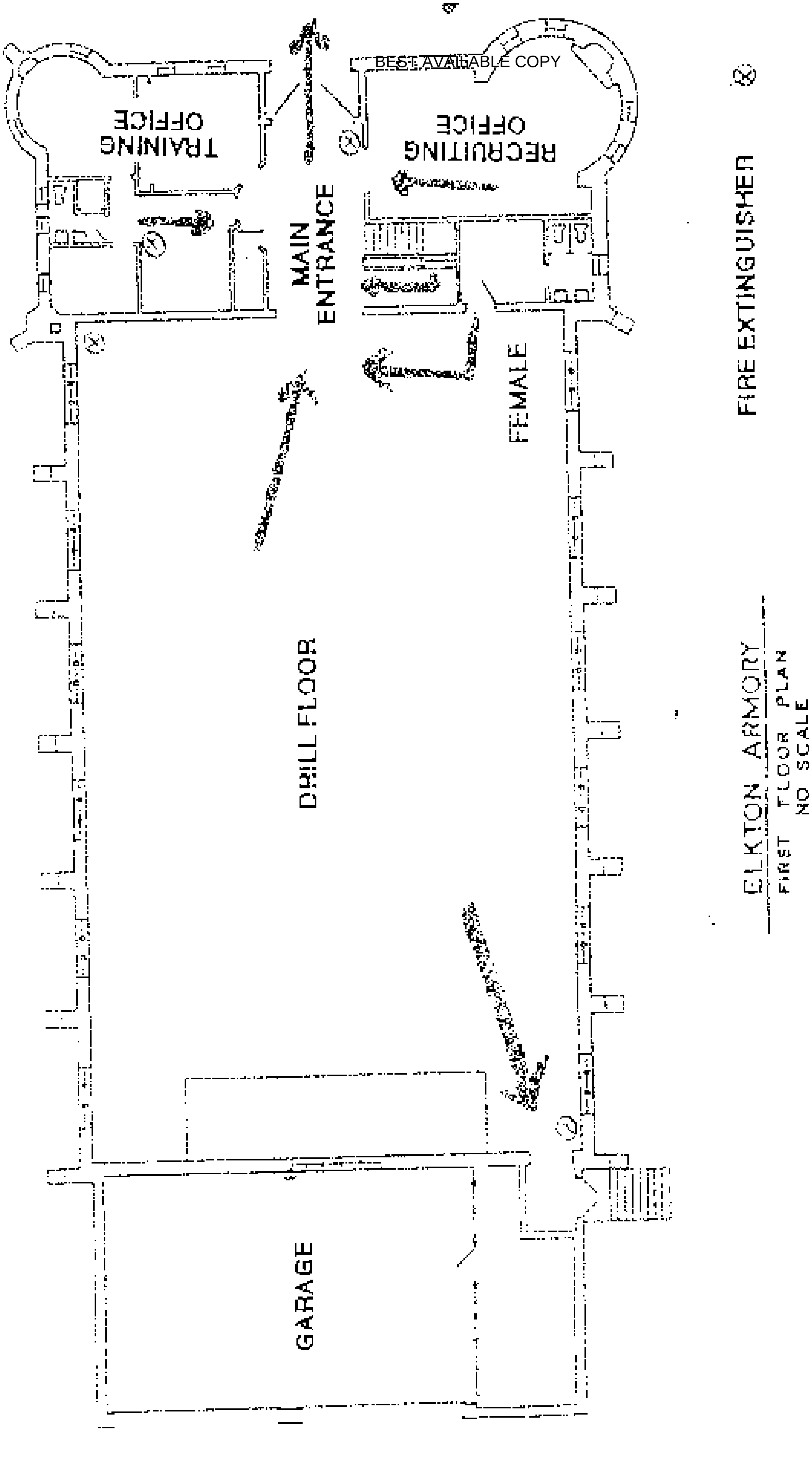


Water damage / damaged paint, back left corner of boiler room

Appendix C
Floor Plans

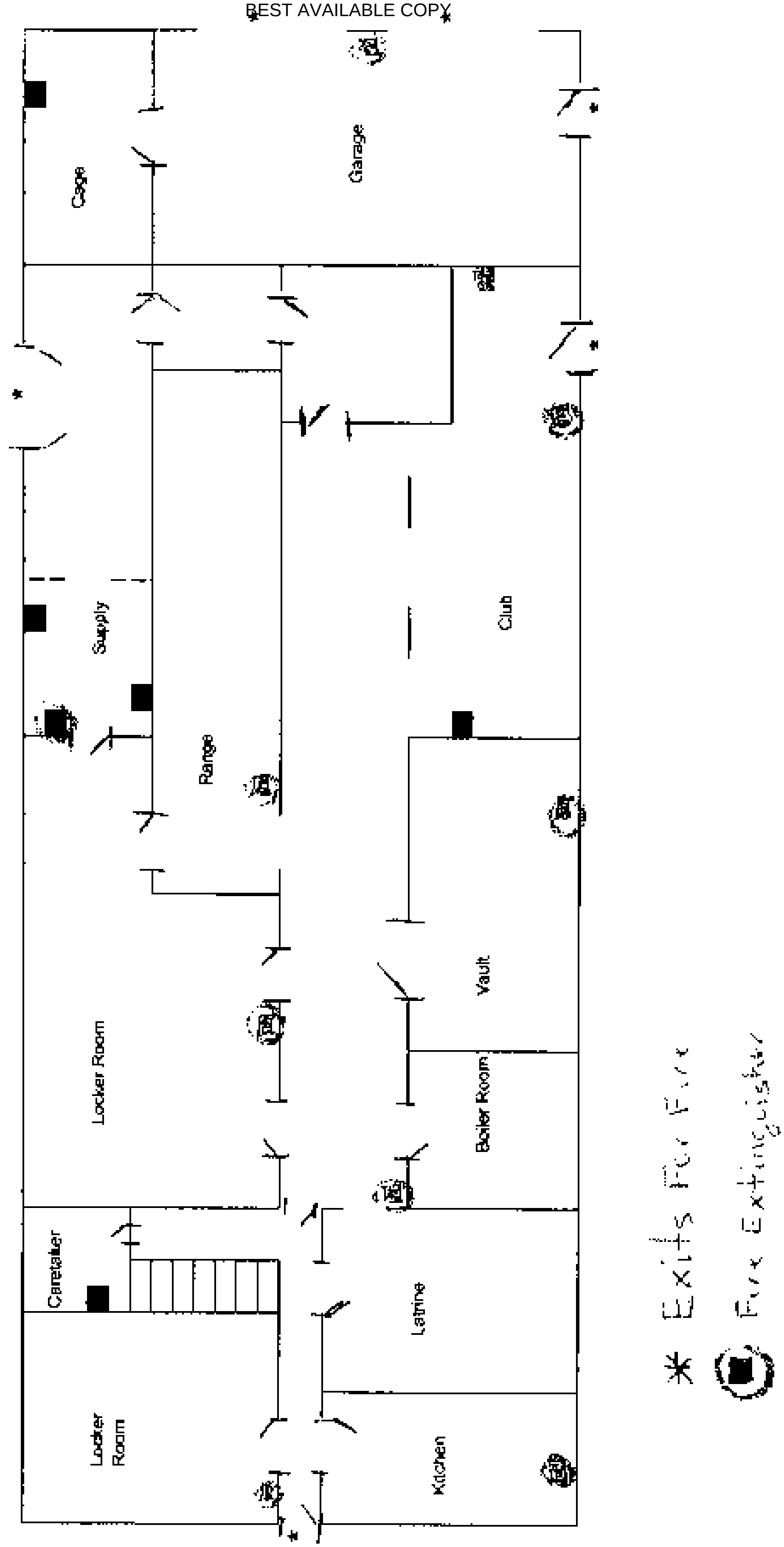
FIRE EVACUATION PLAN

BEST AVAILABLE COPY



BEST AVAILABLE COPY

BEST AVAILABLE COPY



LOWER LEVEL

Appendix D
References

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Appendix D. References

1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead

2. American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2010 Edition

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition

4. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007

5. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Thermal Environmental Conditions for Human Occupancy, 55-2004

6. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

7. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

8. National Emission Standard Hazardous Air Pollutants (NESHAP) – The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h)(3)]

10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation

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COMPLIANCE MANAGEMENT INTERNATIONAL

1215 Manor Drive, Suite 205
Mechanicsburg, PA 17055
Phone: 717.590.7031
Fax: 717.590.7936
www.complianceplace.com

Industrial Hygiene Survey Report

National Guard Facility
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**

Non-Responsive [redacted]

Manager, Industrial Hygiene Services

Table of Contents

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on May 30, 2013, at the Elkton Readiness Center located at 101 Railroad Avenue, Elkton, MD 21921. The survey was performed by Mr. [redacted].

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 (CO_2) 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.

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Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 micrometer (um) mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Lead Testing Results Summary

Sample #	Location	Air ug/m^3	Surface ug/ft^2
1	Drill Hall	<6.7	*
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
8	Converted Firing Range/Wall locker Storage – Floor	*	<110
9	Converted Firing Range/Wall Locker Storage – Top of Wall Locker	*	<110
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	1st SG Office – Top of Safe	*	170
15	Commander Office – Top of File Cabinet	*	<110
16	2nd Floor Classroom – Top of Table	*	<110
17	Blank Wipe	*	<12
18	Blank Air	<3	*
-	**Criteria**	**50**	**200**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2 =** micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Sources:

1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges
2. OSHA 29CFR1910.1025 Lead Standard

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The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 “Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges” as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Lead surface and air samples were collected. The following is a summary of the sample results from this survey.

- Surface levels of lead were below the recommended guideline of 200 ug/ft^2 in all 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/m^3).

- 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.

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Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98011EL). The light meter was last calibrated in November 2012. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Drill Hall	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
1st 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
2nd Floor Classroom	55.5	50	Yes
Commanders Office	**26.1**	**30-50**	**No**
2nd Floor Locker Room	36.5	7	Yes

Table Notes:

1. FC = Foot Candles
2. **Bolded** results did not meet listed criteria

Source: ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

The lighting level did not meet the minimum recommended guideline in the 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%.

The following table summarizes the measurements collected.

IAQ Assessment Summary

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**

Table Notes:
1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **°F =** degrees Fahrenheit

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements met the recommended 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.
    - 2nd floor efflorescence was observed on the exterior walls
    - 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

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Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A. Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

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 Analyzed:**	6/11/2013
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003		

Attention: [redacted]

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments
13067219	19	5	5	--	--	--	--	--	55	--	--	40	NP	Off-White	Homogeneous	LBP	

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

NAD = "No Asbestos Detected" TR = "Trace equals less than 1% of this component"

Uncertainty: For samples containing asbestos in range of 1-10% the CV is 0.43, 11-35% CV=0.55, >35 CV=0.23

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Technical Director Peerawut Chaikeenee

Analyst(s) Lom Butruk

Lom Butruk

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 or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 516027

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Elkton - RC
2. Job Location: Elkton MD
3. Job #: [redacted] P.O. #: W912K6-09-A-0003
4. Contact Person [redacted] @ phone # (410) 942-0273
5. Submitted by [redacted] [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☒ Immediate Date Due: ____
☐ 24 Hours Time Due: ____
Comments: ____

NORMAL BUSINESS HOURS
~~☒ Immediate~~ ☐ 3 Day
☐ Next Day ☒ 5 Day +
☐ 2 Day Date Due: 6/11/13
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ In[redacted] with Report
☒ [redacted] @ compliance place.com
☐ Fa[redacted] @us.army.mil
☐ Ve[redacted] @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____(QTY)
☐ Fiberglass ____(QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____(QTY)
☐ NIOSH 7402 ____(QTY)
☐ Other (specify ____) ____(QTY)
PLM Bulk
☒ EPA 600 – Visual Estimate 1 (QTY)
☐ EPA Point Count ____(QTY)
☐ NY State Friable 198.1 ____(QTY)
☐ Grav. Reduction ELAP 198.6 ____(QTY)
☐ Other (specify ____) ____(QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____(QTY)
☐ NY State PLM/TEM ____(QTY)
☐ Residual Ash ____(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____(QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____(QTY)
☐ Quan. (s/area) Dust D6480-99 ____(QTY)
TEM Water
☐ Qual. (pres/abs) ____(QTY)
☐ ELAP 198.2/EPA 100.2 ____(QTY)
☐ EPA 100.1 ____(QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples ____°C)

Metals Analysis
☐ Pb Paint Chip ____(QTY)
☐ Pb Dust Wipe (wipe type Ghost) 15 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ____(QTY)
☐ Pb TCLP ____(QTY)
☐ Drinking Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Waste Water ☐ Pb____(QTY) ☐ Cu____(QTY) ☐ As____(QTY)
☐ Pb Furnace (Media ____) ____(QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
☐ Spore-Trap ____(QTY) ☐ Surface Vacuum Dust ____(QTY)
☐ Surface Swab ____(QTY) ☐ Culturable ID Genus (Media ____) ____(QTY)
☐ Surface Tape ____(QTY) ☐ Culturable ID Species (Media ____) ____(QTY)
☐ Other (Specify ____) ____(QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1	Drill Hall	5-30	450					X		X						
2	Converted Range		450					X		X						
3	Drill Hall floor			100 cm²				X				X				
4	Drill Hall Computer							X				X				
5	Drill Hall Table							X				X				
6	Kitchen Fridge							X				X				
7	Kitchen microwave							X				X				
8	Range Converted floor							X				X				
9	Converted Range locker							X				X				
10	Hallway outside Range floor							X				X				
11	Break Classroom Desk							X				X				
12	Supply office Desk							X				X				

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY (CUSTODY)
1. Date/Time RCVD: 6/4/13 @ 1000 Via: Fedex By (Print): MM Sign:
2. Date/Time Analyzed: 6/11/13 @ 15:35 By (Print): Lori Butrick Sign: Lori Butrick
3. Results Reported To: Shirley Champman Via: Email Date: 6/11/13 Time: ____ Initials: LB
4. Comments: JOUR A1385RUD

OW (410) 247-2024 159202 210 REV. 6.08

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 516027

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Submittal Information:

1. Job Name: Elkton RC
2. Job Location: Elkton MD
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person: Non-Responsive [redacted] @ ph Non-Responsive [redacted] 2-0273
5. Submitted by: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due: ______
☐ 24 Hours Time Due: ______
Comments: ______

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☐ 5 Day +
☐ 2 Day Date Due: ______
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ Email: Non-Responsive [redacted] @us.army.mil
☐ Fax: [redacted] @us.army.mil
☐ Verbal [redacted]

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ______(QTY)
☐ Fiberglass ______(QTY)

TEM Air – Please Indicate Filter Type:
☐ AHERA ______(QTY)
☐ NIOSH 7402 ______(QTY)
☐ Other (specify ______) ______(QTY)

PLM Bulk
☐ EPA 600 – Visual Estimate ______(QTY)
☐ EPA Point Count ______(QTY)
☐ NY State Friable 198.1 ______(QTY)
☐ Grav. Reduction ELAP 198.6 ______(QTY)
☐ Other (specify ______) ______(QTY)

MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ______(QTY)
☐ NY State PLM/TEM ______(QTY)
☐ Residual Ash ______(QTY)

TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ______(QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______(QTY)
☐ Quan. (s/area) Dust D6480-99 ______(QTY)

TEM Water
☐ Qual. (pres/abs) ______(QTY)
☐ ELAP 198.2/EPA 100.2 ______(QTY)
☐ EPA 100.1 ______(QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ______°C)

Metals Analysis

☐ Pb Paint Chip ______(QTY)
☐ Pb Dust Wipe (wipe type ______) ______(QTY)
☐ Pb Air ______(QTY)
☐ Pb Soil/Solid ______(QTY)
☐ Pb TCLP ______(QTY)
☐ Drinking Water ☐ Pb ____(QTY) ☐ Cu ____(QTY) ☐ As ____(QTY)
☐ Waste Water ☐ Pb ____(QTY) ☐ Cu ____(QTY) ☐ As ____(QTY)
☐ Pb Furnace (Media ______) ______(QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
☐ Spore-Trap ______(QTY) ☐ Surface Vacuum Dust ______(QTY)
☐ Surface Swab ______(QTY) ☐ Culturable ID Genus (Media ______) ______(QTY)
☐ Surface Tape ______(QTY) ☐ Culturable ID Species (Media ______) ______(QTY)
☐ Other (Specify ______) ______(QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13 Recruiting Office	Desk	5-30		100 in²				X				X				
14 1SG Office	Top of Safe			↓				X				X				
15 Commander Office	Bookshelf							X				X				
16 2nd fl. Class	room - table							X				X				
17 Blank	wipe			0				X				X				
18 Blank	Air		0					X		X						
19 Men's Bathroom	Brown						X				X					

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time: Contact: By:

Date/Time: Contact: By:

Date/Time: Contact: By:

LABORATORY USE ONLY: (CUSTODY)

1. Date/Time RCVD: ____/____/____ @____ Via: ______ By (Print): ______ Sign: ______
2. Date/Time Analyzed: ____/____/____ @____ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ____/____/____ Time: ______ Initials: ______

Posted to NGB FOIA Reading Room
May 2018

FOIA Requested Record #J-15-0085 (MD)
Released by National Guard Bureau

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org
LAB #100470

Client:	National Guard Bureau	**Job Name:**	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:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	6/11/2013
				Report Date:	6/11/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Total ug	Final Result		Comments
13067201	1	Flame	Air	450	N/A	6.7	ug/m³	<3	<6.7	ug/m³	
13067202	2	Flame	Air	450	N/A	6.7	ug/m³	<3	<6.7	ug/m³	
13067203	3	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067204	4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067205	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067206	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067207	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067208	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067209	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067210	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067211	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067212	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067213	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067214	14	Flame	Wipe	****	0.108	110	ug/ft²	18	170	ug/ft²	
13067215	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067216	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067217	17	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13067218	18	Flame	Air Blank	0	N/A	3	ug/m³		<3	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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May, 2018

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #100470

Client:	National Guard Bureau	**Job Name:**	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:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	6/11/2013 **Report Date:** 6/11/2013

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)

%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: Suphin 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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AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **516027**

page 1 of 2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Elkton - RC
2. Job Location: Elkton, MD
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person: [redacted] @ phone # (410) 942-0273
5. Submitted By: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☒ Immediate Date Due: ______
☐ 24 Hours Time Due: ______
Comments: ______

NORMAL BUSINESS HOURS
☒ ~~Immediate~~ ☐ 3 Day
☐ Next Day ☒ 5 Day + Date Due: 6/11/13
☐ 2 Day
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ [redacted] compliance-place.com
☐ Fax: [redacted] us.army.mil
☐ Verb[redacted] us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ______ (QTY)
☐ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ______ (QTY)
☐ NIOSH 7402 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
PLM Bulk
☒ EPA 600 – Visual Estimate 1 (QTY)
☐ EPA Point Count ______ (QTY)
☐ NY State Friable 198.1 ______ (QTY)
☐ Grav. Reduction ELAP 198.6 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ______ (QTY)
☐ NY State PLM/TEM ______ (QTY)
☐ Residual Ash ______ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
☐ Quan. (s/area) Dust D6480-99 ______ (QTY)
TEM Water
☐ Qual. (pres/abs) ______ (QTY)
☐ ELAP 198.2/EPA 100.2 ______ (QTY)
☐ EPA 100.1 ______ (QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples ______ °C)

Metals Analysis
☐ Pb Paint Chip ______ (QTY)
☐ Pb Dust Wipe (wipe type Ghost) 15 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ______ (QTY)
☐ Pb TCLP ______ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ______) ______ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
1 Drill Hall		5-30	450					X		X						
2 Converted Range			450					X		X						
3 Drill Hall floor				100 cm²				X				X				
4 Drill Hall Computer								X				X				
5 Drill Hall Table								X				X				
6 Kitchen Fridge								X				X				
7 Kitchen microwave								X				X				
8 Range Converted floor								X				X				
9 Converted Range locker								X				X				
10 Hallway outside Range floor								X				X				
11 Basement Classroom Desk								X				X				
12 Supply office Desk								X				X				

CLIENT CONTACT
(LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY (CUSTODY)
1. Date/Time RCVD: 6 / 4 / 13 @ 1000 Via: FedEx By (Print): [signature] Sign: [signature]
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ____ / ____ / ____ Time: ______ Initials: ______
4. Comments: 79US 0138 5342

Posted to NGB FOIA Reading Room
May 2018
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OWI (410) 247-2024 159202 210 REV. 6.08

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Focused on Results www.amalab.com
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CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 516027

pg 2 of 2

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4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

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1. Job Name: Elkton RC
2. Job Location: Elkton, MD
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person: [redacted] @ phone #: (410) 942-0273
5. Submitted By: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day ☐ Results Required By Noon
☐ Next Day ☐ 5 Day + (Every Attempt Will Be
☐ 2 Day Date Due: Made to Accomodate)

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ Email: [redacted]us.army.mil
☐ Fax:
☐ Verbal: [redacted]us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area)Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☐ Pb Dust Wipe (wipe type ____) ____ (QTY)
☐ Pb Air ____ (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13 Recruiting office	Desk	5.30		100 cm²				X				X				
14 ISC office	Top of Safe							X				X				
15 Commander office	Desk sill							X				X				
16 2nd fl Class	room - table							X				X				
17 Blank Wipe				0				X				X				
18 Blank Air			0					X		X						
19 Men's Bathroom	Brown						X				X					

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY (CUSTODY)
1. Date/Time RCVD: __/__/__ @ __ Via: __ By (Print): __ Sign:
2. Date/Time Analyzed: __/__/__ @ __ By (Print): __ Sign:
3. Results Reported To: __ Via: __ Date: __/__/__ Time: __ Initials:
4. Comments:

Appendix B. Photographs

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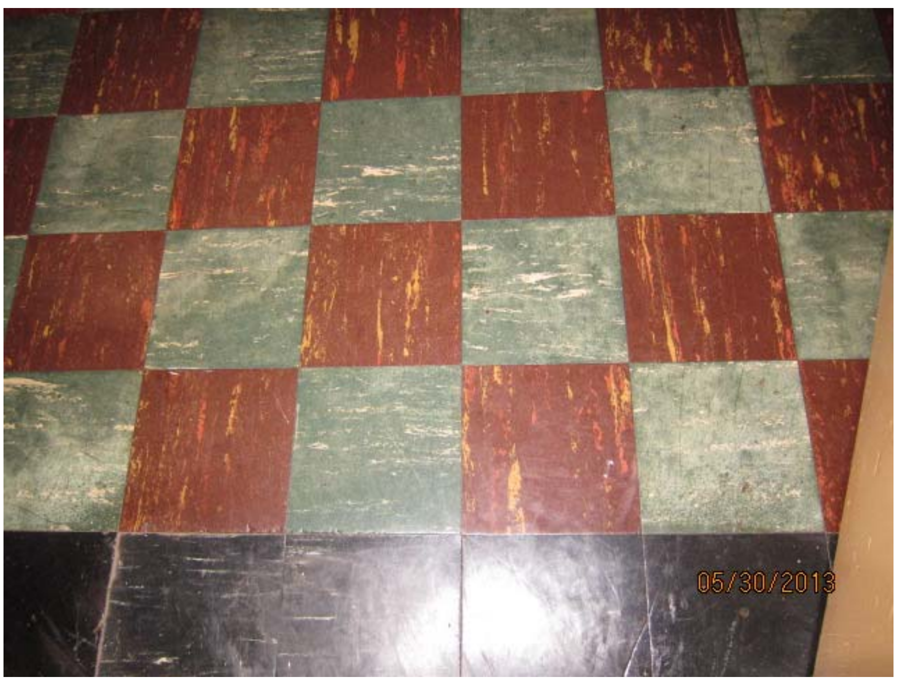
Exterior of facility

Drill Hall

Converted firing range/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

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Appendix C. Floor Plan

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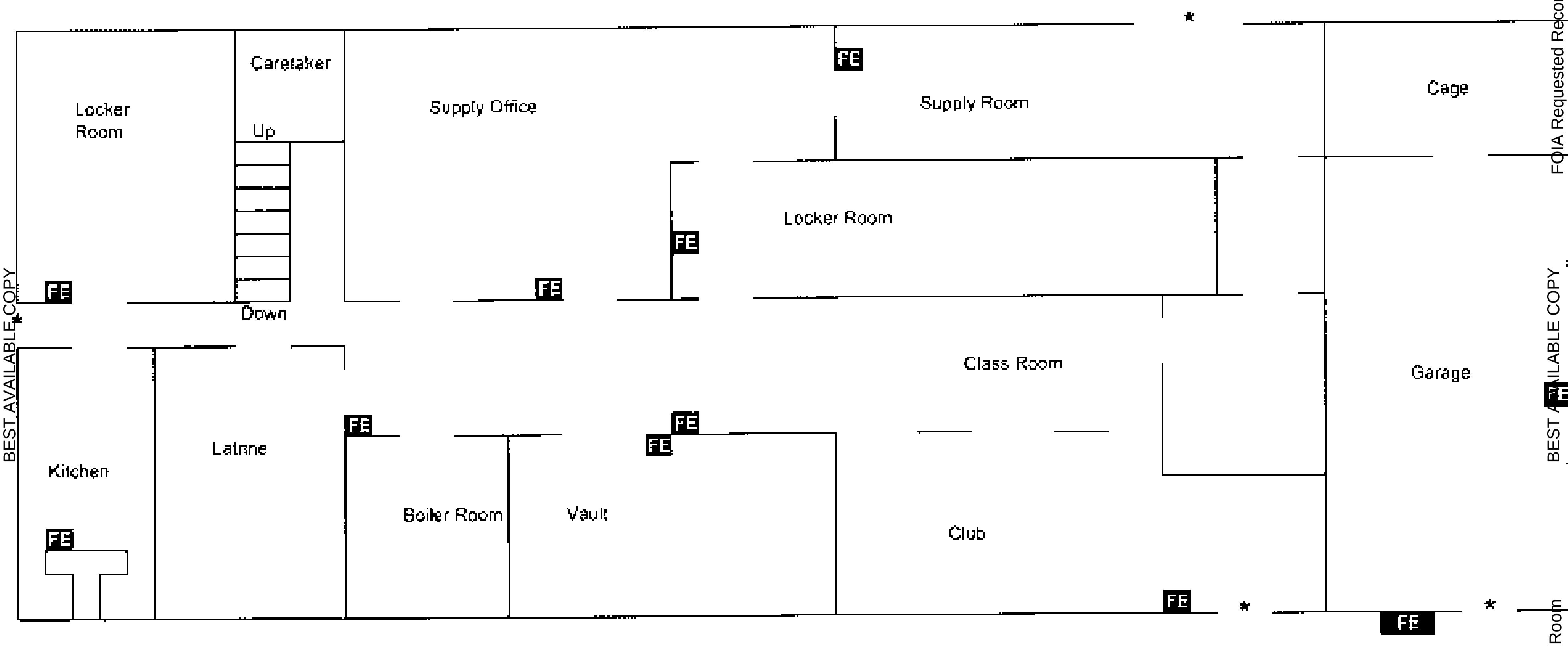
ELKTON ARMORY FIRE PROTECTION PLAN
LOCATION OF FIRE PROTECTION EQUIPMENT



FE Fire Extinguisher

* Building Fire Exits

BASEMENT LEVEL

18 January 2013

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Posted to NGB FOIA Reading Room
May, 2018

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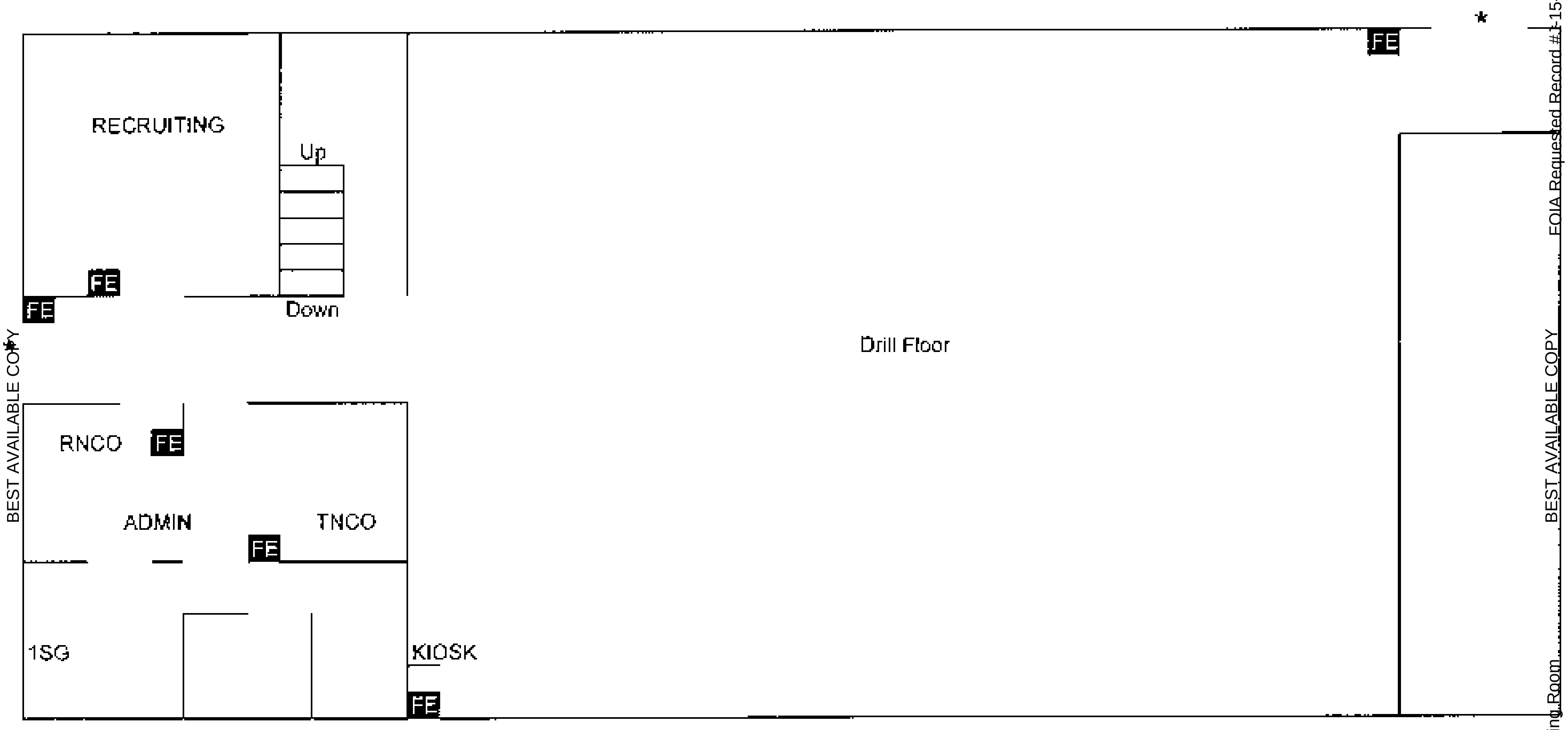
ELKTON ARMORY FIRE PROTECTION PLAN
LOCATION OF FIRE PROTECTION EQUIPMENT



FE Fire Extinguisher

* Building Fire Exits

MAIN FLOOR

18 January 2013

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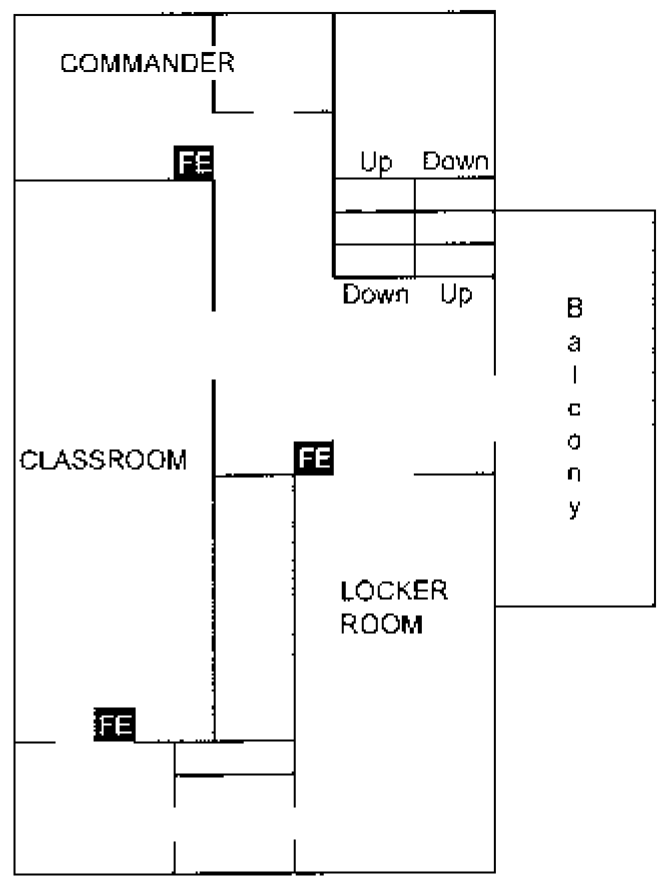
BEST AVAILABLE COPY

ELKTON ARMORY FIRE PROTECTION PLAN
LOCATION OF FIRE PROTECTION EQUIPMENT



FE Fire Extinguisher

* Building Fire Exits

TOP FLOOR

18 January 2013

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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 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

REPLY TO
ATTENTION OF

MCHB-TS-OFS May 2004

MEMORANDUM FOR Army National Guard Bureau (NGB) Region North Industrial Hygiene NGB-AVS-SI-IH/[redacted], 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03 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. [redacted], at DSN 584-5475/3118, commercial (410) 436-5475/3118 or e-mail address at [redacted]@apg.amedd.army.mil.

ENCL

[redacted]
Industrial Hygienist
Industrial Hygiene Field Services Program

Readiness thru Health
Printed on Recycled Paper

U.S. Army Center for Health Promotion and Preventive Medicine

USACHPPM

MDARNG FACILITIES IH BASELINE SURVEY
CPT MICHAEL CRESAP ARMORY
FREDERICK, MD
55-ML-01ED-03

Approved for public release; distribution unlimited.

CHPPM FORM 432-E (MCHB-CS-IPD), OCT 03

Readiness Thru Health

U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed $3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- ♦ *Integrity is the foundation*
- ♦ *Excellence is the standard*
- ♦ *Customer satisfaction is the focus*
- ♦ *Its people are the most valued resource*
- ♦ *Continuous quality improvement is its pathway*

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

CHPPM FORM 433-E (MCHB-CS-IPD), OCT 03 *(reverse)*

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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/m^3. 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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disposable coveralls as extra protection when working in areas identified as having elevated levels of lead. Address all potential lead hazards before extending this facility to use for children. If children will be using this facility, clean surfaces to the EPA dust-lead standards for young children of 40 $\mu g/ft^2$ on floors and 100$\mu g/ft^2$ for dust-lead on window sills. Test drinking water from water fountains and faucets for lead.

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.

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MDARNG Facilities IH Baseline Surveys, CPT Michael Cresap Armory, Frederick, MD
Project No. 55-ML-01ED-03

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

REPLY TO
ATTENTION OF

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03

LOCATION: CPT Michael Cresap Armory, Frederick, MD

1. AUTHORITY. E-Mail dated 28 February 2003 from Ms [redacted], Industrial Hygienist, MD Army National Guard, to the USACHPPM Industrial Hygiene Field Services Program.

2. PURPOSE OF EVALUATION. To conduct surveys at Army National Guard (ARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions at ARNG facilities. The survey will serve to establish a baseline so that a worker's history of exposures is provided for each civilian or military employee.

3. BACKGROUND INFORMATION.

a. Armory Mission. Infantry and Communications 1st Battalion, 115 Infantry Regiment, Company B.

b. Date of Construction. 1980.

c. POC. SGM [redacted] (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 [redacted], Environmental Compliance Assessment Coordinator for the MD NGB, stated that all lead and asbestos has been abated.

Readiness thru Health

Printed on Recycled Paper

(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 [redacted] 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 0.003mg/m^3 lead in air. One of 7 surface dust-lead wipe samples exceeded the USACHPPM recommended decontamination level of 200µg/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.

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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/ft^2, and 100µg/ft^2 for dust-lead on window sills. These levels were developed for children under 6 spending at least 60 hours per year in pre-1978 facilities. 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 child-occupied facility's minimum time requirement for child use, USACHPPM believes that there is a potential hazard for children using this facility. AR 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them. Although this facility may comply with EPA and Army regulations, exposures for children under 6 may exceed those that the regulations are intended to prevent.

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 0.003mg/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.

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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 [redacted]@apg.amedd.army.mil.

[redacted]
INDUSTRIAL HYGIENIST
USACHPPM LEAD AND ASBESTOS TEAM LEADER
Industrial Hygiene Field Services Program
EPA AHERA Asbestos Inspector and Management Planner/
Certification Number MD-070340
EPA Lead Inspector and Lead Risk Assessor/
Certification Number 04-7913

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ENCLOSURE

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.

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APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

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Subject: Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 $\mu g/ft^2$. This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. EPA standards (40 CFR 745.227(e)(8)(viii))are not directly applicable because they are developed for floors (40 $\mu g/ft^2$), windowsills (250 $\mu g/ft^2$) and window troughs (400 $\mu g/ft^2$) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. OSHA has no specific requirement for work area surfaces. The lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. OSHA used to cite a level of 200 $\mu g/ft^2$ in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 $\mu g/ft^2$ is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels above these recommendations do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All states will receive this guidance when it is completed.

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m^3 averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

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MDARNG Facilities IH Baseline Surveys, CPT Michael Cresap Armory, Frederick, MD
Project No. 55-ML-01ED-03

APPENDIX B

SITE MAPS

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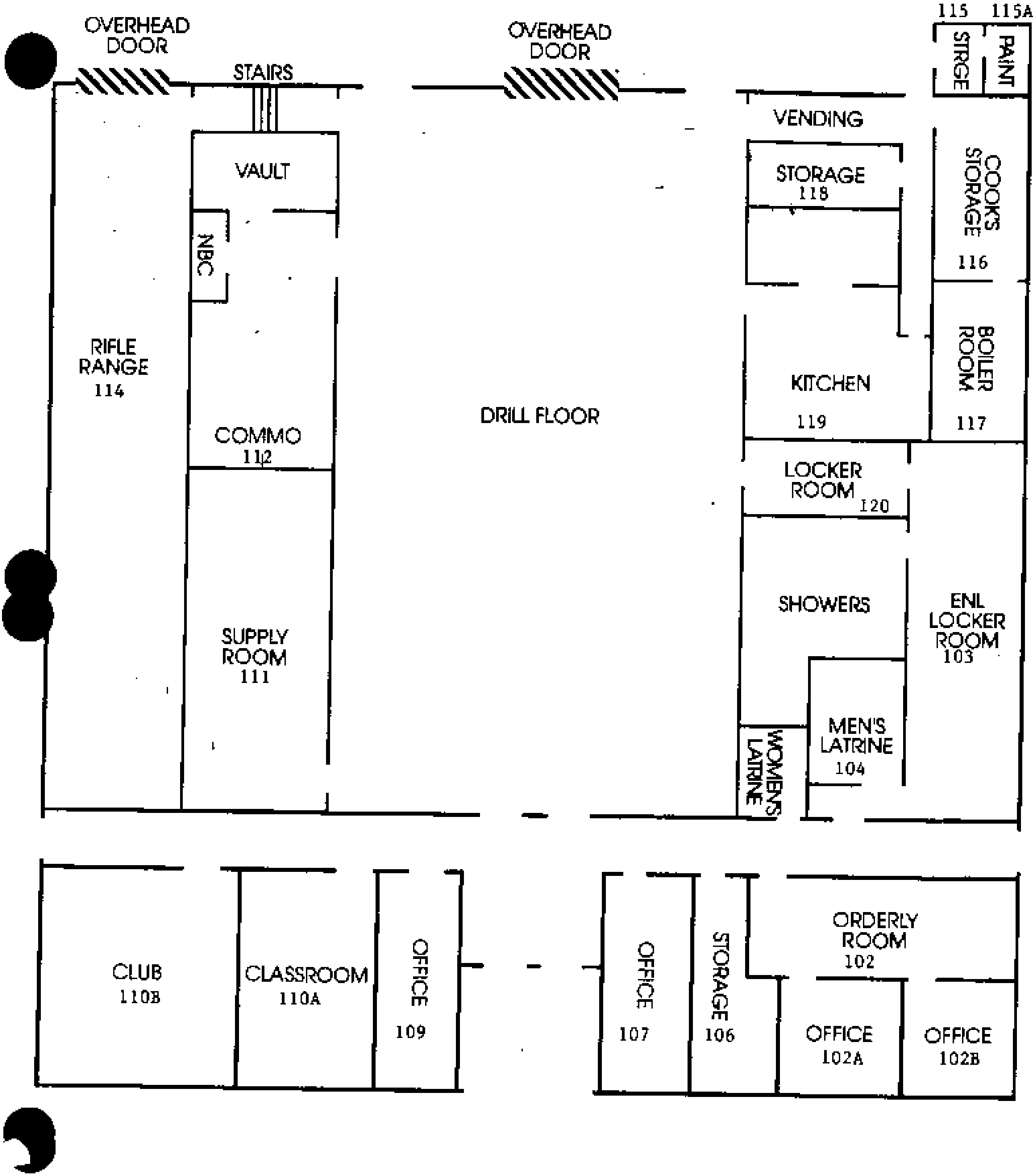

FREDRICK

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APPENDIX C

PHOTOGRAPHS

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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 area floor outside former IFR
1466	Storage area floor outside former IFR near NBC cage
1468	Mold growth caused from roof leak

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1459

1460

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BEST AVAILABLE COPY

1462

1463

1464

1465

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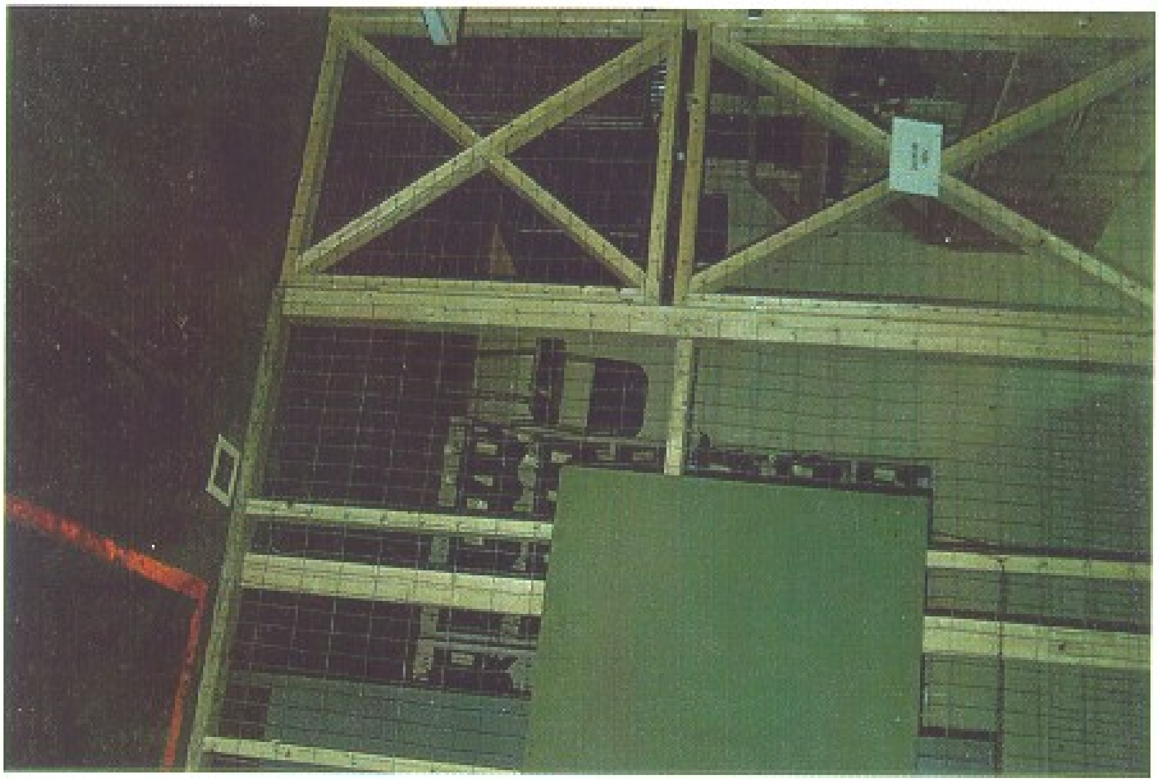
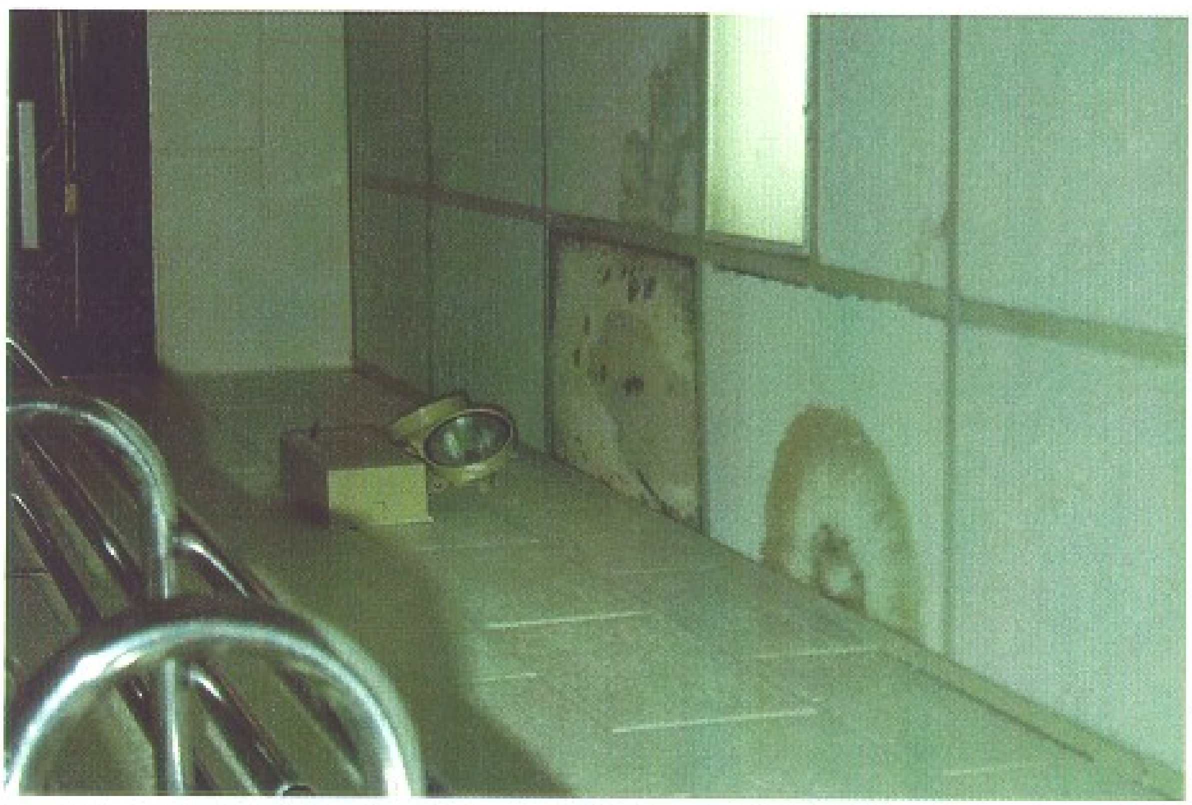
1466



1468



APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

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			Indoor Range Info					
Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (µg/ft²)
			No			Unknown		
FRW01	Frederick	Frederick					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						
	Frederick	Frederick					Office area directly adjacent to former IFR	BDL
FRW04	Frederick	Frederick						
	Frederick	Frederick					Floor outside former IFR door	27
FRW05	Frederick	Frederick						
	Frederick	Frederick					Cabinet near ventilation 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

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DATA CHEM LABORATORIES, INC.

Submitted To: [redacted]
US Army CHPPM
Bldg. 1570 Stark Road
APG, MD 21015

Reference Data:		**Lead**
	Client Sample No.:	SPAS01 through Blank01
	P.O. No.:	Not Available
	Sample Location:	Fredrick NG Armory & OMS
	Sample Type:	Filter
	Method Reference:	NIOSH 7300
	DCL Set ID No.:	03-S-3990
	DCL Sample ID No.:	03-24663 through 03-24667
	Sample Receipt Date:	8/19/2003
	Preparation Date:	08/20/03
	Analysis Date:	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.

[redacted]
Analyst

[redacted]
Reviewer

CINCINNATI OFFICE
4388 GLENDALE-MILFORD ROAD
CINCINNATI, OHIO 45242-3706
513 733-5336, FAX 513 733-5347

WEST COAST OFFICE
11 SANTA YORMA COURT
NOVATO, CALIFORNIA 94945
800 280-8071, FAX 415 893-9469

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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	
% Recovery	LCS		99.	
RPL			1.	

ND = not detected at or above the reporting limit (RPL).
LCS = laboratory control sample.

[redacted]
Analyst

[redacted]
Reviewer

DATA CHEM LABORATORIES, INC.

ANALYTICAL REQUEST FORM

☐ **REGULAR** Status (5 working days from receipt)

☐ **RUSH** Status Required - ADDITIONAL CHARGE
RESULTS REQUIRED BY ____________ DATE
CONTACT DATACHEM LABS PRIOR TO SENDING SAMPLES

Date ______ Purchase Order No. ______
Quote No. ______

Company Name . COMMANDER, USACHPPM
Address ATTN: MCHB-TS-OFS
5158 BLACKHAWK ROAD
APG, MD 21010-5403

City [redacted] Zip
Person to Conta[redacted]
Telephone (410) 436-3118
Fax Telephone (410) 436-5471
Billing Address (if different from above)
MD NG office
Havre de Grace, MD

Sample Collection
Sampling Site FREDRICK NG ARMORY + OMS
Industrial Process ______
Date of Collection 5 Aug 03
Time Collected ______
Date of Shipment ______
QC Require[redacted]
Collector's [redacted]
Signature [redacted]

REQUEST FOR ANALYSES 03-S-3990

Laboratory Use Only	Client Sample Number	Media Type*	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
24663	SPAS01		325.2	LEAD - NIOSH 7300
24664	SPAS02		297.8	LEAD - NIOSH 7300
24665	SPAS03		332.3	LEAD - NIOSH 7300
24666	BLANK02			LEAD - NIOSH 7300
24667	Blank01			Lead - NIOSH 7300

* (E-MAIL RESULTS TO [redacted] apg.amedd.army.mil)

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date/Time
[redacted]	6 Aug 03	[signature]	8/7/03
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time

4388 Glendale Milford Road / Cincinnati, OH 45242 • 800-458-1493 or 513-733-5336 / Fax: 513-733-5347

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DATA CHEM LABORATORIES, INC.

Submitted To: [redacted]
US Army CHPPM
Bldg. 1570 Stark Road
APG, MD 21015

Reference Data:	**Lead**
Client Sample No.:	SPAS01 through Blank01
P.O. No.:	Not Available
Sample Location:	Fredrick NG Armory & OMS
Sample Type:	Filter
Method Reference:	NIOSH 7300
DCL Set ID No.:	03-S-3990
DCL Sample ID No.:	03-24663 through 03-24667
Sample Receipt Date:	8/19/2003
Preparation Date:	08/20/03
Analysis Date:	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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[redacted]
Analyst

[redacted]
Reviewer

CINCINNATI OFFICE
4388 GLENDALE-MILFORD ROAD
CINCINNATI, OHIO 45242-3706
513 733-5336, FAX 513 733-5347

WEST COAST OFFICE
11 SANTA YORMA COURT
NOVATO, CALIFORNIA 94945
800 280-8071, FAX 415 893-9469

Results
Lead

Client #	DCL #	Sample Volume (L)	µg/sample	mg/m^3
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	
% Recovery	LCS		99.	
RPL			1.	

ND = not detected at or above the reporting limit (RPL).
LCS = laboratory control sample.

Non-Responsive [redacted]
Analyst

Non-Responsive [redacted]
Reviewer

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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 96596-1**
Client:	**Army National Guard Ill - West**
Client Project Number / P.O.:	**None Given**
Client Project Description:	**None Given**
Date Samples Received:	**August 19, 2003**
Analysis Type:	**USEPA SW846 3050B / AA(7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 22, 2003**

Client ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
SPBLANK01	EM 806502	0.11	BDL	23	BDL
SPW01	EM 806503	0.11	BDL	23	BDL
SPW02	EM 806504	0.11	BDL	23	BDL
SPW03	EM 806505	0.11	17.3	23	157
SPW04	EM 806506	0.11	BDL	23	BDL
SPW05	EM 806507	0.11	4.5	23	41
SPBLANK02	EM 806508	0.11	BDL	23	BDL
SPW06	EM 806509	0.11	56.3	23	512
SPW07	EM 806510	0.11	3.8	23	35
SPW08	EM 806511	0.11	BDL	23	BDL
SPW09	EM 806512	0.11	BDL	23	BDL
SPW10	EM 806513	0.11	BDL	23	BDL
SPW11	EM 806514	0.11	BDL	23	BDL
SPW12	EM 806515	0.11	BDL	23	BDL
SPW13	EM 806516	0.11	BDL	23	BDL
SPBLANK03	EM 806517	0.11	BDL	23	BDL
FRBLANK01	EM 806518	0.11	BDL	23	BDL
FRW01	EM 806519	0.11	91.7	23	834
FRW02	EM 806520	0.11	6.3	23	57
FRW03	EM 806521	0.11	BDL	23	BDL
FRW04	EM 806522	0.11	3.0	23	27
FRW05	EM 806523	0.11	BDL	23	BDL
FRBLANK02	EM 806524	0.11	BDL	23	BDL
FRW06	EM 806525	0.11	BDL	23	BDL
FRW07	EM 806526	0.11	10.7	23	97

***Calculations Based On A 1 sq.ft. Sample Area Unless Otherwise Noted**

BDL = Below Detection Limit

Data Qa

Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211
(303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

REMIT TO: 2059 Bryant St. Denver, CO 80211

Invoice to:

Army National Guard IH - West
3401 Quebec Street, Suite 7200
Denver CO 80207

Invoice Date: August 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	Analytical Procedure	Unit Price	Amount
	RES Job #: RES 96596-1 Desc: None Given Submitted By: Army National Guard IH - West P/O No: None Given Contact: Non-Responsive [redacted]		
25	AA/ICP Metal Wipe 3-5 Day 4125-02	$7.50	$187.50
		Invoice Total:	$187.50

RESERVOIRS ENVIRONMENTAL, INC.

2059 Bryant St., Denver CO 80211

Due Date: 8/22 -> 8/20/03

RESI Job #: 96594

Due Time: 2:45pm

Page 2 of 2

SAMPLES SUBMITTED BY:
Company: COMMANDER, USACHPPM
Address: ATTN: MCHB-TS-DRS, 5158 BLACKHAWK ROAD, APG, MD 21010-5403
Contact:
Contact:
Project Number and/or P.O. #:
Project Description/Location:

INVOICE TO: (IF DIFFERENT)
MD NG office
Havre de Grace, MD
Phone: 410 436 3118 Fax: 410 436 5471 Pager:
Phone: Fax: Pager:
[redacted] Address: @amedd.army.mil

After Hours/Weekend CHARGE: Amount $ Authorized by:

Additional fees apply for after hours and holidays for all analysis types. Samples will be analyzed during normal laboratory hours unless otherwise arranged and specified on the chain of custody. Turnaround is subject to laboratory volume. You will be notified if delays are expected.

ASBESTOS LABORATORY HOURS: Weekdays: 7am - 7pm
PCM/PLM ___ 2 Hour RUSH ___ 24 hour ___ 3-5 weekdays
TEM ___ 6 Hour RUSH ___ 24 hour ___ 3-5 weekdays
Prior Notice REQUIRED for TEM 6 Hour RUSH

METALS LABORATORY HOURS: Weekdays: 8am - 5pm
AA ___ SPECIAL RUSH ___ 24 Hour ___ 3-5 Day
RCRA 8 ___ SPECIAL RUSH ___ 5 Day ___ 10 Day
TCLP ___ SPECIAL RUSH ___ 5 Day ___ 10 Day
Prior Notice REQUIRED for SPECIAL RUSH AA, RCRA or TCLP
RCRA and TCLP SPECIAL RUSH is 3 Day Turnaround

ANALYTICAL METHOD
AIR: PCM 7400A, 7400B, OSHA; TEM AHERA, Level II, 7402, ISO; Pres/Abs, ISO-Indirect Preps, Chatfield; AA / ICP ___ Metal ___ RCRA 8; Dust Total Respirable
BULK: PLM Short report, Long report, Point Count; TEM ..., Quant, Semi-quant; [✓] AA / ICP Lead ___ Metal ___ RCRA 8; Paint, Soil, Dust, Wipe, TCLP (ASTM E 1792 approved wipes only)
WATER: TEM Drinking, Waste Water; AA Water ___ Metal ___ RCRA 8; Drinking, Waste Water
OTHER: Specify

Special Instructions: PLEASE EMAIL

	Client Sample Number	Volume	EM #
1.	SP BLANK 03		54-17
2.	FR BLANK 01		18
3	FR W01		19
4.	FR W02		20
5.	FR W03		21
6	FR W04		22
7.	FR W05		23
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APPENDIX E

REFERENCES

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APPENDIX E

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MDARNG Facilities IH Baseline Surveys, CPT Michael Cresap Armory, Frederick, MD
Project No. 55-ML-01ED-03

APPENDIX F

LEAD CLEANING GUIDANCE

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CHAPTER 14: CLEANING

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.

2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.

3. Have sufficient cleaning equipment and supplies *before* beginning work.

4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.

5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.

6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.

7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.

8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.

9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.

10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.

11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.

12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.

13. Paint or otherwise seal treated surfaces and interior floors.

14. Conduct a clearance examination (see Chapter 15).

15. If clearance is not achieved, repeat the final cleaning.

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16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.

17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.

18. Cleaning equipment list:

    - HEPA vacuums.
    - Detergent.
    - Waterproof gloves.
    - Rags.
    - Sponges.
    - Mops.
    - Buckets.
    - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
    - 6-mil plastic bags.
    - Debris containers.
    - Waste water containers.
    - Shovels.
    - Rakes.
    - Water-misting sprayers.
    - 6-mil polyethylene sheeting (or equivalent).

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Chapter 14: Cleaning

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris *and* dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?
- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

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C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

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Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards *and* were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

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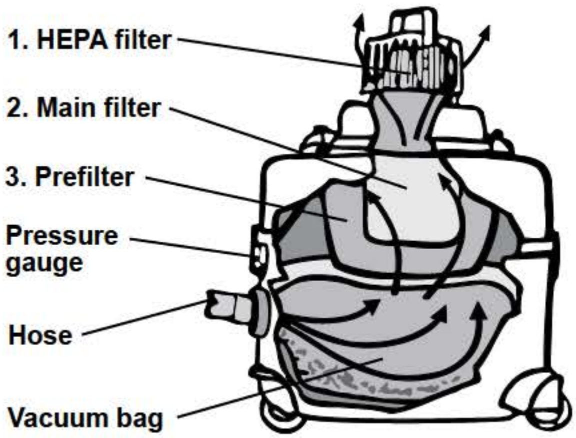
Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum
Most HEPA-vacuums have three filters: HEPA filter, main filter, and pre-filter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the pre-filter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

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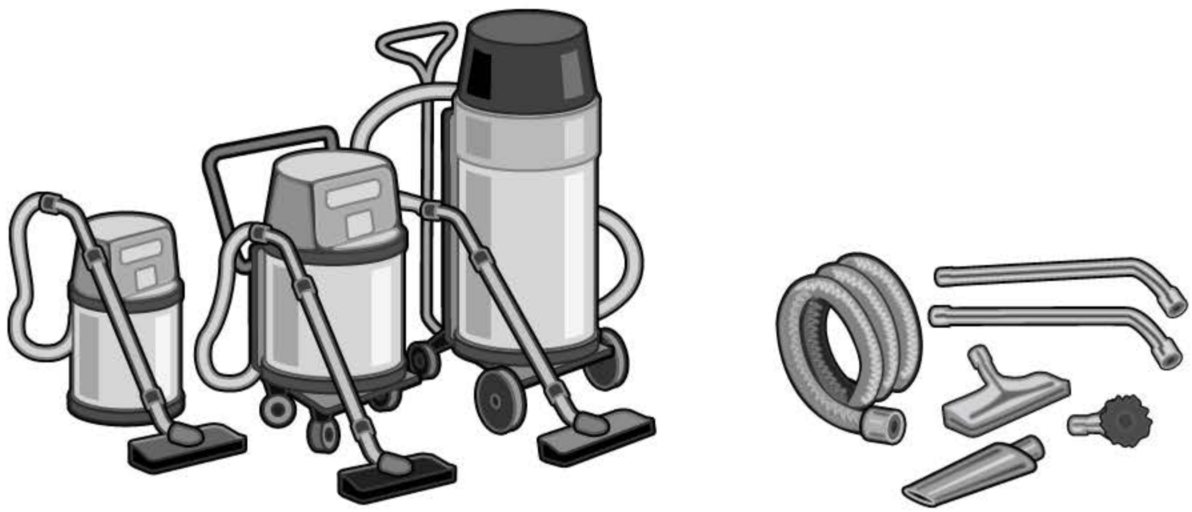
Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

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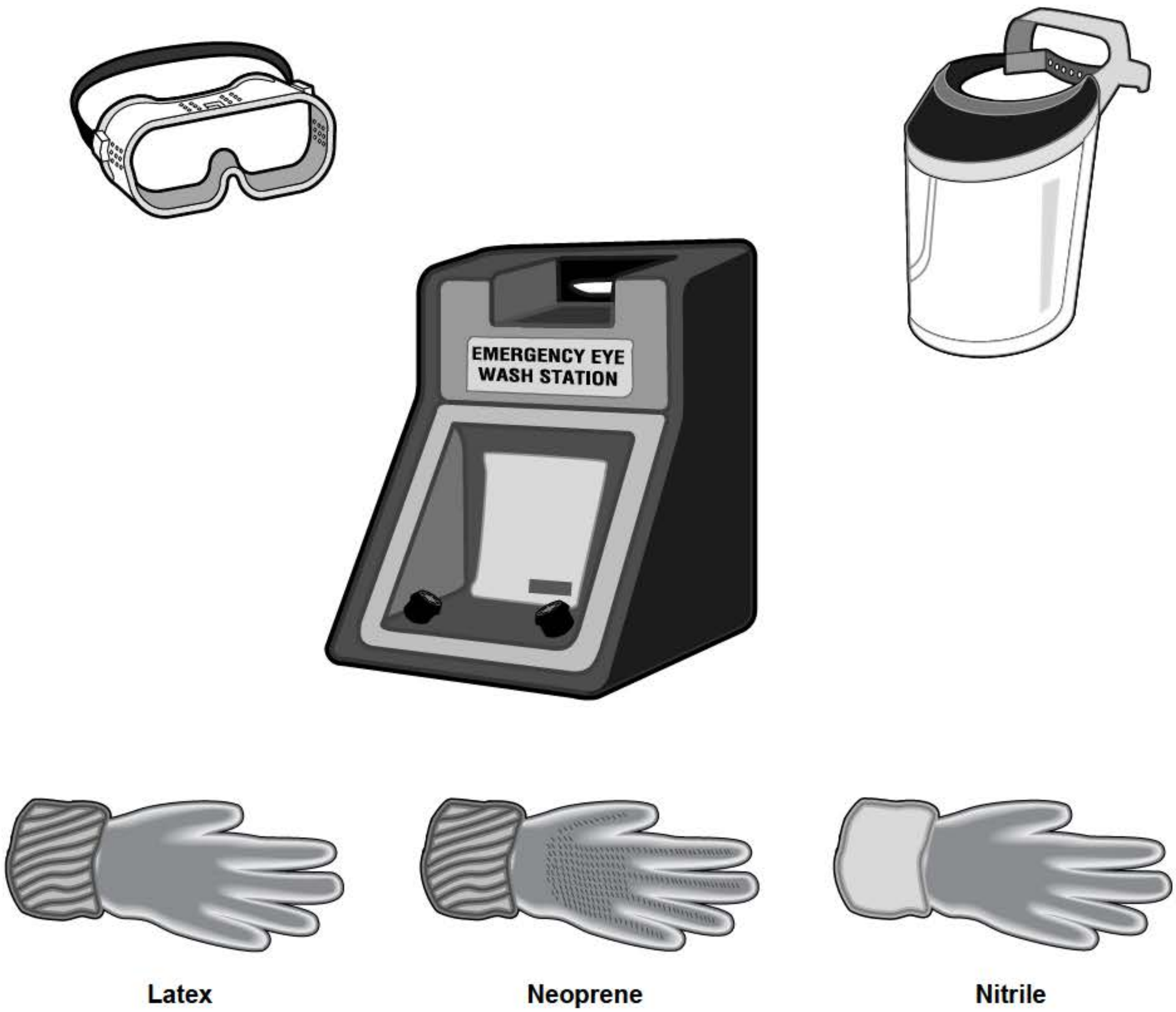
Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

- First, the area is HEPA vacuumed.

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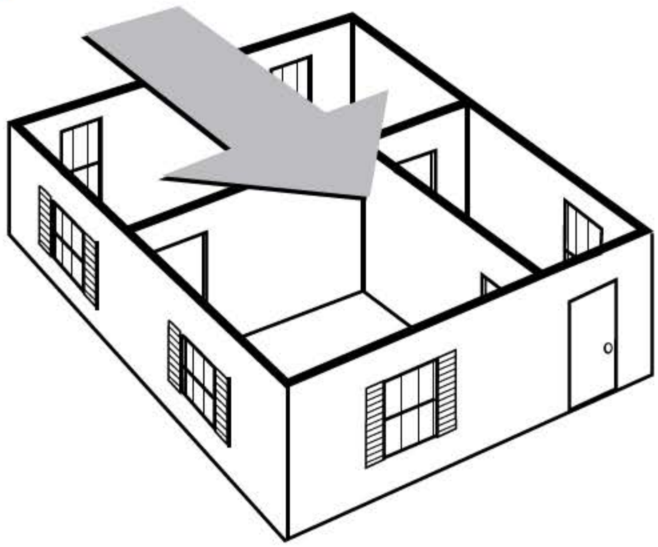
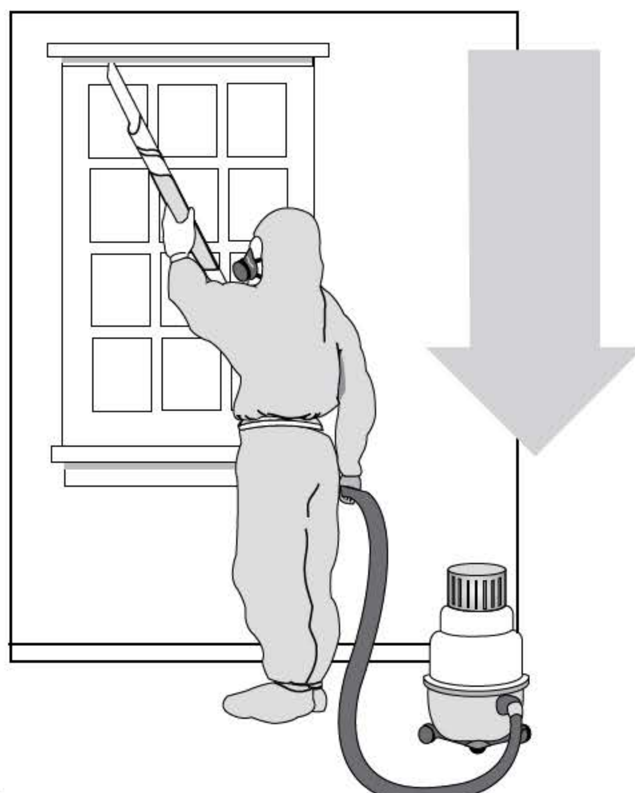
Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on, and work down to the floor. Do every inch of the windows, especially the window troughs.



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- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.

Rubber Cone

Dust Brush

Powered Carpet Beater

Wheeled Floor Nozzle

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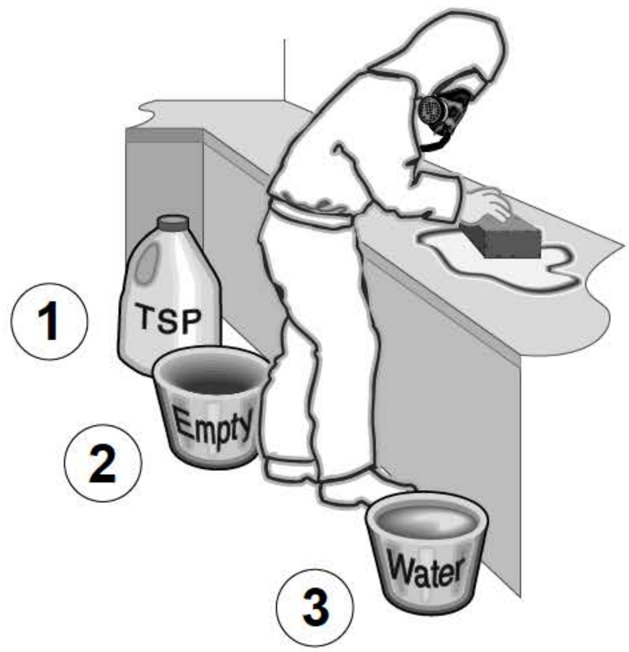
Figure 14.4c (continued)

Wash all surfaces with suitable detergents
Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces

Wet Mop Floor

Don't Dry Sweep

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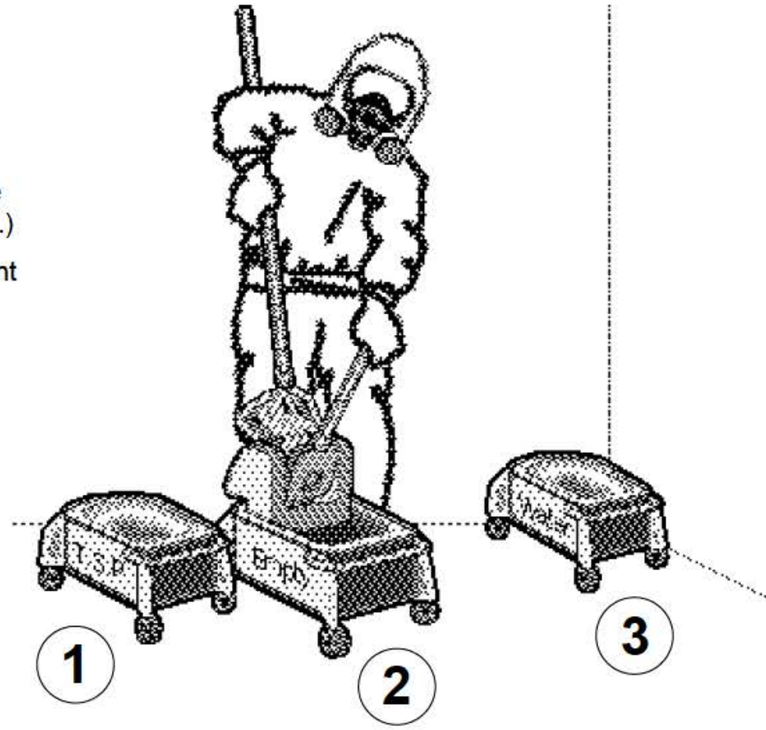
Figure 14.4c (continued)

Use the 3-Bucket System.

To wash: Use string mops and mop buckets with wringers. (Some experts say NEVER use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.



Squeeze out the mophead in empty bucket #2. Return to bucket #1 for more detergent solution and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

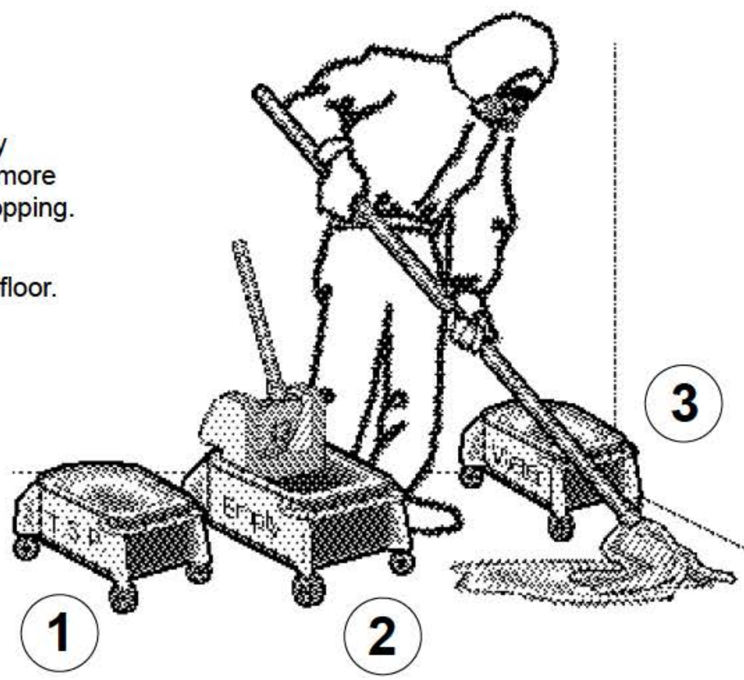


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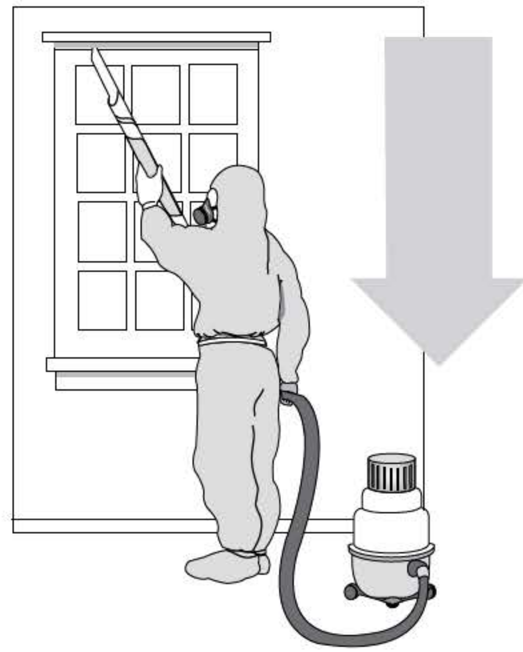
Figure 14.4d (continued)

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

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Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.

Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

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belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

- 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

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containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water *and cleaned.* All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

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the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).

Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This

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option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dust-retaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table 14.1 Initial Cleaning Wipe-Test Failure Rates for Various Abatement Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)

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and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993).

These *Guidelines* do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Cycle Number	Mass Removal Efficiency Percentages			
	Cleaning Method			
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.8	67.0	29.4
5	59.3	88.9	72.1	32.5
6	61.6	91.2	74.4	34.9
7	63.8	93.1	76.4	36.5
8	67.5	95.4	77.5	38.1
9	67.5	97.7	78.7	40.1
10	67.2	100.0	80.2	41.7
11		102.3	80.2	41.7
12		104.6	84.1	44.8
13		104.6	84.5	46.8
14		103.8	84.5	48.4
15				49.6
16				50.8
17				52.4
18				53.6
19				54.4
20				55.2

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) *Effectiveness of Clean-up Techniques for Leaded Paint Dust*

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APPENDIX G

MOLD GUIDANCE

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Army Facilities Management Information Document on Mold Remediation Issues

TG 277

FEBRUARY 2002

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Readiness thru Health

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

Concern about indoor exposure to mold has been increasing as the public becomes more aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions.

This document provides the best and most current guidance for remediation of clean water damage (<48 hours) and mold contamination (>48 hours) into one resourceful Army guide. This guide has been designed to provide information to facilities management individuals who have little or no experience with mold remediation. It will assist them in making a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to develop or evaluate an in-house remediation plan or evaluate a remediation plan submitted by an outside contractor. If an outside contractor is employed, they must have experience cleaning up mold. Check their references, and have them follow the recommendations presented in this document, EPA guidelines, and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). A multi-disciplinary team approach to mold concerns is best. A health and safety professional, such as an industrial hygienist, should be consulted prior to any remediation activities to assist in the project.

Molds produce tiny spores to reproduce. Mold spores float through the indoor and outdoor air continually. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or uncorrected. There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.(1)

In all situations, the underlying cause of water accumulation must be rectified or mold growth will recur. Any initial water infiltration should be stopped and clean up began immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth. (Refer to Appendix A for detailed guidance on clean water damage response). If the source of water is elevated humidity, actions to maintain the relative humidity levels below 60% to inhibit mold growth should be taken (2). Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

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MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilating, and air-conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide adequate drainage and slope the ground away from the foundation.

REMEDIATION PLANNING

- Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Select cleanup methods for moldy items (Appendix B)
- Select Personal Protection Equipment (PPE)- protect remediators (Appendix B)
- Select containment equipment - protect building occupants (Appendix B)
- Select remediation personnel who have the experience and training needed to implement the remediation plan and use PPE and containment as appropriate

REMEDIATE MOISTURE AND MOLD PROBLEMS

- Fix moisture problem, implement repair plan and/or maintenance plan
- Dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Clean and dry moldy materials (Appendix B)
- Discard moldy porous items that can't be cleaned (Appendix B)

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REMEDIATION PROCEDURES

Four levels of abatement are described below. The size of the area impacted by mold contamination primarily determines the type of remediation. The sizing levels below are based on professional judgment and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of mold and preventing dust contaminated with mold from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement. The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. (3)

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be discarded if possible. All materials to be reused should be dry and visibly free from mold. Routine inspections should be conducted to confirm the effectiveness of remediation work. (1 and 3)

The use of bleach or other biocides is questionable in most cases (8). The effectiveness of bleach in reducing living mold is dependent on concentration, residual chlorine levels, and contact time on the surface (8). All of these factors are difficult to control during remediation. Removal of all mold growth can generally be accomplished by physical removal of materials supporting active growth and thorough cleaning of non-porous materials (4). Therefore, application of a biocide serves no purpose that could not be accomplished with a detergent or cleaning agent (4).

The use of gaseous ozone or chlorine dioxide for remedial purposes is **not** recommended. Both compounds are highly toxic and contamination of occupied space may pose a health threat. Furthermore, the effectiveness of these treatments is unproven. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."(4)

FOUR REMEDIATION LEVELS

[Adapted from NYCDOH Guidelines on Assessment and Remediation of Fungi in Indoor Environments (3) and EPA (1)]

Level I: Small Isolated Areas – Total surface area affected less than 10 square feet - e.g., ceiling tiles, small areas on walls. Refer to Appendix B for detailed guidance.

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Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas used by remediation workers for egress should be cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Level II: Medium – Total Surface Area affected between 10 and 100 square feet - e.g., several wallboard panels. (See Appendix B for detailed guidance).

The following procedures *at a minimum* are recommended:

Refer to Appendix C for proper PPE selection. Limited or Full protection may be required depending on the situation.

Refer to Appendix D for Containment procedures.

The work area and areas directly adjacent should be covered with a single layer of 6 mil fire-retardant polyethylene sheet(s) and taped before remediation, to contain dust/debris.

Seal ventilation ducts/grills in the work area and areas directly adjacent with 6 mil polyethylene sheeting. Use an exhaust fan with a High Efficiency Particulate Air (HEPA) filter to generate negative pressurization.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and surrounding areas should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level III be followed.

Level III: Large Area – Total Surface Area affected greater than 100 square feet or potential for increased occupant or remediator exposure during remediation is estimated to be significant. (See Appendix B for detailed guidance).

The following procedures are recommended:

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from occupied spaces using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft^2) follow Level I guidance for PPE and containment and for a areas (>10 ft^2) follow Medium (Level II) or when greater than 100 ft^2 follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

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Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended (7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

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Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and removed in double-bagged 6-mil plastic. When a decontamination room is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

All areas should be left dry and visibly free from contamination and debris.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air (4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If remediation sampling is necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HAZARD COMMUNICATION

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

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CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.

2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.

3. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.

5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.

6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.

7. Occupational Safety & Health Administration. *Respiratory Protection Standard, 29 Code of Federal Regulations 1910.134.* 63 FR 1152. January 8, 1998.

8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force*, AIHA Press, Fairfax, VA, May 2001.

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APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water Damage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£	
Water-Damaged Material†	**Actions**
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours§	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans.
Ceiling tiles	• Discard and replace.
Cellulose insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	• Discard and replace.

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Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling should be pried away from wall for drying

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£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.
These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

† If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

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APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

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Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

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APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

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Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips
• Always maintain the containment area under negative pressure. • Exhaust fans to outdoors and ensure that adequate makeup air is provided. • If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

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the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*[1] will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination[2].

Safety Tips While Investigating and Evaluating Mold and Moisture Problems[3]

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate[1].

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems[3].

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination[2].

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air[4]. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control[4]."

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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.

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APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

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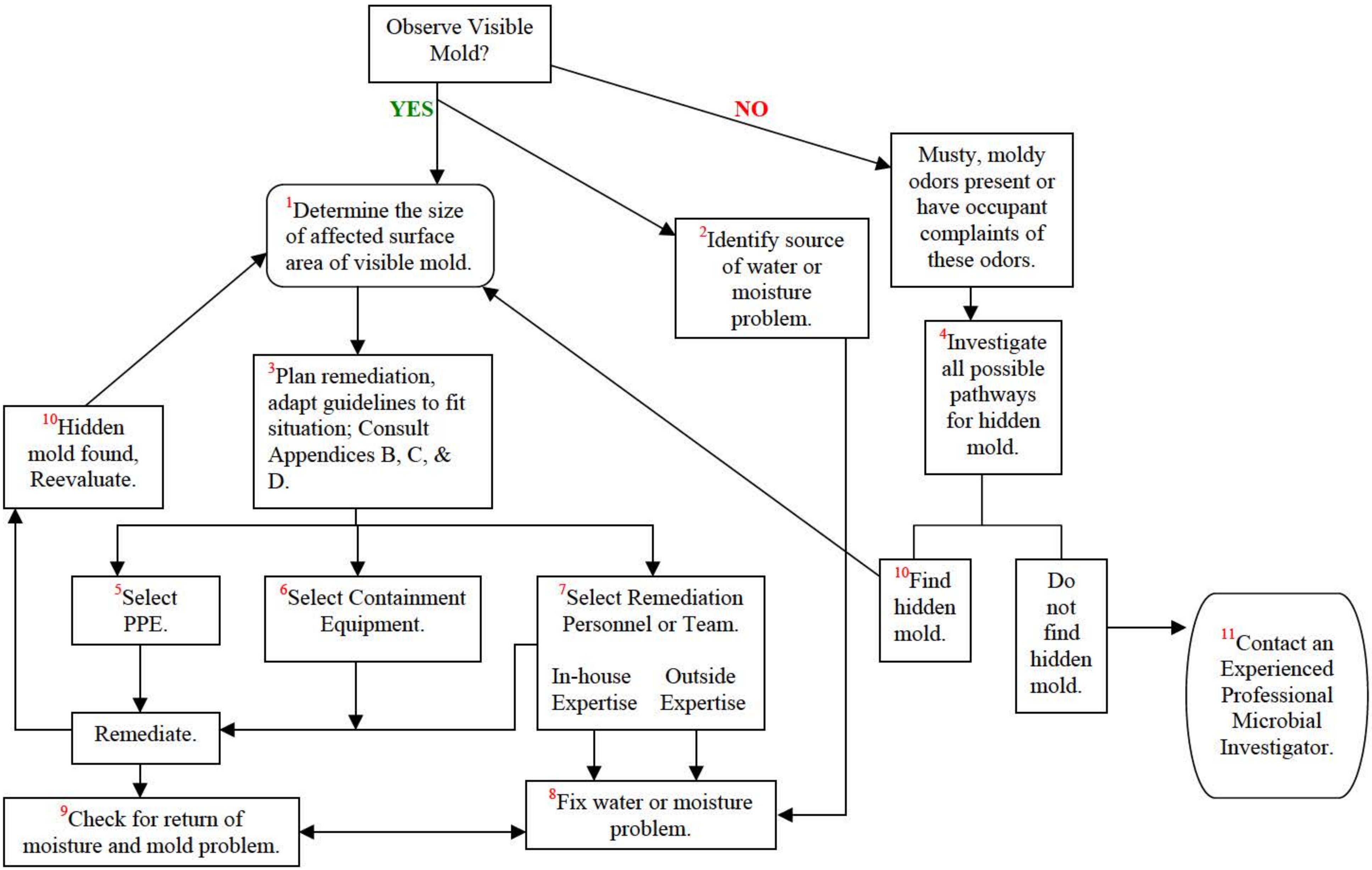
MOLD INVESTIGATION DECISION LOGIC



MOLD INVESTIGATION DECISION LOGIC NOTES:

1. Roughly approximate the total surface area of visible mold. Categorization of the remediation levels are sometimes borderline, so when trying to decide the category to apply, consider the extent of visible growth, such as a heavy blanket of growth on the surface, to barely visible. If heavy growth is apparent, consider moving up to the next level of protection.

2. Do not skip this step. Address the source of water or moisture problem or the mold will simply reappear.

3. Always protect the health and safety of the building occupants and remediators.

4. Mold may be hiding on the backside of drywall, vinyl wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads. Check walls behind furniture, pipe chases and utility tunnels, porous thermal or acoustic liners inside ductwork, or check the rafters (due to roof leaks or insufficient insulation)[3].

5. Utilize appendices B and C for remediation guidance. Use your best judgment during investigations, if not disturbing the mold you may need minimal to no PPE. Do not alarm building occupants unnecessarily, but protect yourself as necessary.

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities[3]. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

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APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

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Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 and 100 ft^2			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

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APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

®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 (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

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minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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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: Non-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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August 4, 2010
Project No. 1061-03

National Guard Region North
Industrial Hygiene Office
301 Old Bay Lane
Havre De Grace, MD 21078-4003

Attn: [redacted]

Project: Army National Guard Readiness Center, Industrial Hygiene Evaluation
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 [redacted] 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 [redacted]. 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 ($\mu g/ft^2$)***
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 surface	0.111	< 110
F-W-13	5-17-10	North lobby area, on trophy cabinet	0.111	< 110
F-W-14	5-17-10	Room 117-1, above entrance door, supplied-air grill	0.111	< 110
F-W-15	5-17-10	Room 102, top of copy machine	0.111	< 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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determination whether any employee's exposure exceeds the action level (AL) of 30 μg/m^3 or the maximum permissible exposure limit (PEL) of 50 μg/m^3 as 8-hour time weighted averages (TWAs). If employee exposures are less than 30 μg/m^3, training is required under the Hazard Communication 29 CFR 1926.59. Exposures that exceed the AL or PEL require the employer to comply with additional requirements, including air monitoring, additional training, and restricted work practices as outlined in OSHA 29 CFR 1926.62.

Representative 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 – Frederick Readiness Center Lead Air Sample Results									
Sample #	**Sample Type**	**Sample Location**	**Flow Rate**	**Start**	**Stop**	**Vol.**	**Rpt. Limit (μg/m³)**	**Results (μg/m³)**	**8 hr TWA (μg/m³)**
May 17, 2010									
F-A-1	FB	Field Blank	---	---	---	0	3.0	< 3.0	N/A
F-A-2	PS	Sgt. [redacted], working in office room 117-1	2.0	0827	1534	854	3.5	< 3.5	≤ 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 μg/m³ is averaged over an 8 hr work shift

3.0 - PHYSICAL CONDITION OF FACILITY / PERSONNEL CONCERNS

3.1 - Lead Based Paint

During the industrial hygiene evaluation of the Army National Guard 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 (CO_2) throughout the facility. A calibrated TSI Q-Trak Model 7565 Indoor Air Quality Monitor equipped with a Q-Trak Probe 982 was utilized to record indoor air quality measurements.

Carbon dioxide is a natural component of air and the amount of CO_2 in a given air sample is commonly expressed as parts per million (ppm). The outdoor air in most locations contains about 380 ppm carbon dioxide. Higher outdoor CO_2 concentrations can be found near vehicle traffic areas, industry and sources of combustion. The concentrations of CO_2 found in most offices are well below the OSHA Permissible Exposure Limit (PEL) of 5,000 ppm when averaged over an 8-hour time period for an industrial workplace. While levels below 5,000 ppm are considered to pose no serious health threat, studies have indicated that individuals in offices with elevated CO_2 concentrations tend to report drowsiness, lethargy and a general sense that the air is stale. Ventilation rates for office spaces are defined by various codes and standards. The most widely accepted standard is the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 62. According to ASHRAE Standard 62.1-2007, CO_2 concentrations below 700 ppm above the outdoor level are considered to indicate adequate ventilation and provide human comfort. The CO_2 measurements collected during this industrial hygiene evaluation ranged from 471 ppm to 612 ppm and indicate adequate ventilation within the facility.

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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 66.1ºF to 77.1ºF (except for a reading of 82.7ºF 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 (ppm)*	*CO (ppm)*	*Relative Humidity (%)*	*Temperature (ºF)*
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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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
Lighting Survey

Location	*Measurement in Foot Candles*	*Requirement in Foot Candles*	*Requirement 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

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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 [redacted] on May 17, 2010:

Bonus Environmental, LLC recommends that any areas of concerns outlined within this report be evaluated to ensure the necessary actions are made. Following the completion of the industrial hygiene evaluation, Bonus Environmental, LLC found the following safety and/or indoor air quality conditions of the facility to be within acceptable levels/condition in regards to the following:

- Carbon Dioxide
- Carbon Monoxide
- Presumed Asbestos Containing Materials
- Ergonomics
- 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,

[redacted]

Principal
Bonus Environmental, LLC

[redacted]

Principal
Bonus Environmental, LLC

Frederick_10_Report.docx

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Appendix A

Shop Diagram

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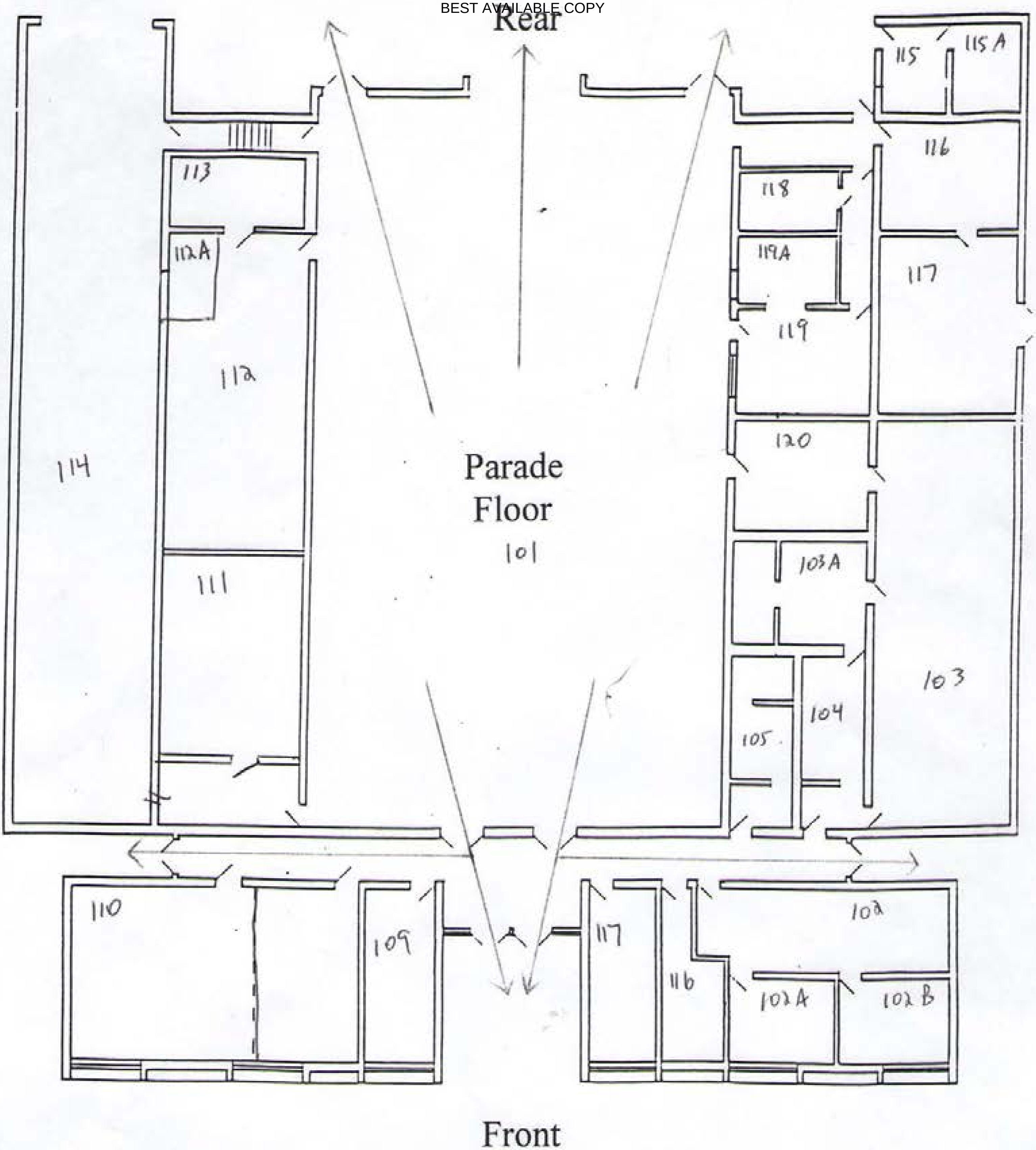

Frederick Armory Evacuation Plan

S
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Appendix B

Lead Sample Results

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

RECEIVED JUN 14 2010

ACCREDITED LABORATORY AIHA Environmental Lead See aihaleap.org for details

100470

NY ELAP

10920

Client: National Guard Bureau

Address: 301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation
Havre de Grace, Maryland 21078

Attention: [redacted]

Job Name: Frederick Armory

Job Location: Frederick, MD

Job Number: Frederick Armory

P.O. Number: W912K6-09-A-0003

Chain Of Custody: 507189

Date Submitted: 5/21/2010

Person Submitting: [redacted]

Date Analyzed: 5/28/2010 **Report Date:** 6/1/2010

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Total ug	Final Result	Comments
1047845	F-A-1	Flame	Air Blank	0	N/A	3 ug/m³		<3 ug	
1047846	F-A-2	Flame	Air	854	N/A	3.5 ug/m³	<3	<3.5 ug/m³	
1047847	F-A-3	Flame	Air	846	N/A	3.5 ug/m³	<3	<3.5 ug/m³	
1047848	F-W-1	Flame	Wipe Blank	****	N/A	12 ug		<12 ug	
1047849	F-W-2	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047850	F-W-3	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047851	F-W-4	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047852	F-W-5	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047853	F-W-6	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047854	F-W-7	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047855	F-W-8	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047856	F-W-9	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047857	F-W-10	Flame	Wipe	****	0.111	110 ug/ft²	32	290 ug/ft²	
1047858	F-W-11	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047859	F-W-12	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047860	F-W-13	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047861	F-W-14	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047862	F-W-15	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047863	F-W-16	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. 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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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA Accredited Laboratory — Environmental Lead — See aihaiqap.org for details
100470
NY ELAP
10920

Client: National Guard Bureau
Address: 301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation
Havre de Grace, Maryland 21078
Attention: [redacted]

Job Name: Frederick Armory
Job Location: Frederick, MD
Job Number: Frederick Armory
P.O. Number: W912K6-09-A-0003

Chain Of Custody: 507189
Date Submitted: 5/21/2010
Person Submitting: [redacted]
Date Analyzed: 5/28/2010 **Report Date:** 6/1/2010

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments
1047864	F-W-17	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047865	F-W-18	Flame	Wipe	****	0.111	110 ug/ft²	15	140 ug/ft²	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results
Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accreditation applies only to paint chip, wipe, and soil samples.

Analyst: Ang Cao

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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AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 19396

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	5/28/2010

	Result		Percent Recovery	RPD	Comment
Preparation Blank	-0.075	ppm			Acceptable
Report Limit Verification Sample	0.272	ppm	81.6%		Acceptable
Expected Spike Level (ppm) 0.3333					
Duplicate Sample 1		mg/Kg			
Duplicate Sample 2		mg/Kg			Acceptable
Matrix Spike Analysis					
Spiked Sample					Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample 1	309.410	µg	102.01%		Acceptable
Laboratory Control Sample 2	287.202	µg	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
507189	47848	F-W-1
507189	47849	F-W-2

SDG Number: 19396

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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507189	47850	F-W-3
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-14
507189	47862	F-W-15
507189	47863	F-W-16
507189	47864	F-W-17
507189	47865	F-W-18
507190	47890	CL-W-21
507190	47891	CL-W-22

SDG Number: 19396

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AMA Analytical Services, Inc.

Focused on Results!!

NVLAP 101143-0
NY ELAP 10920
AIHA 100470

Submitting Samples for National Guard Jobs

1) All samples shall be submitted to AMA Analytical Services, Attn: Sample Receiving, utilizing the enclosed Chain-of-Custody Form. The highlighted areas must be completed by the Subcontractor, however, the Sample Information/Analysis/Matrix section will not need to be completed if field date sheets are submitted with the samples. Please be sure to include a contact phone number for the person submitting the samples.
2) Results shall be reported via email to the following persons:
   a. National Guard Subcontractor [redacted] @bonusenvironmental.com
   b. [redacted] CIV NGB: [redacted]us.army.mil
   c. [redacted] CIV NGB: [redacted]rmy.mil
3) Hard Copy Reports & Invoices shall be [redacted] the following manner:
   a. Original Invoices and Copies of Reports shall be sent to the National Guard
      National Guard Bureau
      Attn: [redacted]
      301-I[redacted] Bay Lane
      Attn: NGB-AVN-SI, State Military Reservation
      Havre de Grace, Maryland 21078
   b. Original Reports shall be sent the National Guard Subcontractor

      Attn: [redacted]
      Office: 989-779-7686
      Cell: 989-621-3862

4) All Pb Wipes shall be handled in the following manner:
   a. All samples shall be analyzed utilizing FLAA procedures
   b. Samples whose results are reported as less than the reporting limit, and the reporting limit is greater than 40ug/ft2 shall be re-analyzed utilizing GFAA procedures.
5) All other samples – Pb Paints, Soils, & Airs, PCM Airs, PLM Bulks, TEM Airs, & TEM Bulks shall be analyzed utilizing standard analytical procedures

AMA Analytical Services, Inc.
Focused on Results
www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

OWI (410) 247-2024

159202

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

507189

Sheet 1 of 2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Frederick Armory
2. Job Location: Frederick, MD
3. Job #: Frederick Armory
4. Contact Pers[redacted] P.O. #: W912K6-09-A-0003
5. Submitted By[redacted] @ phone # (410) [redacted]3

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due: ______
☐ 24 Hours Time Due: ______
Comments: ______

Reporting Information (Results will be provided [redacted] as technically feasible):
NORMAL BUSINESS HOURS
☐ Immediate ☐ Next Day ☐ 2 Day
☐ 3 Day ☒ 5 Day + Date Due: 5-28-10
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

[redacted] REPORT TO:
☒ Inclu[redacted] with Report
☒ Email[redacted] @bonuj environmental.com
☐ Fax: [redacted] @us.army.mil
☐ Verbal [redacted] @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ______ (QTY)
☐ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ______ (QTY)
☐ NIOSH 7402 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ______ (QTY)
☐ EPA Point Count ______ (QTY)
☐ NY State Friable 198.1 ______ (QTY)
☐ Grav. Reduction ELAP 198.6 ______ (QTY)
☐ Other (specify ______) ______ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__ (Qual) PLM__ (Quan) PLM/TEM__ (Qual) PLM/TEM__ (Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ______ (QTY)
☐ NY State PLM/TEM ______ (QTY)
☐ Residual Ash ______ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
☐ Quan. (s/area) Dust D6480-99 ______ (QTY)
TEM Water
☐ Qual. (pres/abs) ______ (QTY)
☐ ELAP 198.2/EPA 100.2 ______ (QTY)
☐ EPA 100.1 ______ (QTY)

☑ All samples received in good condition unless otherwise noted.
(TEM Water samples ______ °C)

Metals Analysis
☐ Pb Paint Chip ______ (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 18 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ______ (QTY)
☐ Pb TCLP ______ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ______) ______ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
☐ Spore-Trap ______ (QTY) ☐ Surface Vacuum Dust ______ (QTY)
☐ Surface Swab ______ (QTY) ☐ Culturable ID Genus (Media ______) ______ (QTY)
☐ Surface Tape ______ (QTY) ☐ Culturable ID Species (Media ______) ______ (QTY)
☐ Other (Specify ______) ______ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
F-A-1	Field Blank	5-17	0	—				X		X						
F-A-2	Sgt Irizarry	↓	854	—				X		X						
F-A-3	Rm 114		846	—				X		X						
F-W-1	Field Blank		—	—				X				X				
F-W-2	Drill Hall		—	4"x4"				X				X				
F-W-3	Drill Hall		—	↓				X				X				
F-W-4	Drill Hall		—					X				X				
F-W-5	Drill Hall		—					X				X				
F-W-6	Drill Hall		—					X				X				
F-W-7	Rm 114		—					X				X				
F-W-8	Rm 114		—					X				X				
F-W-9	Rm 114	↓	—	↓				X				X				

CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 5 / 21 / 10 @ 9:45 Via: FedEx By (Print): Surat Watson Sign: [signature]
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: Mail Date: 6 / 1 / 10 Time: 1905 Initials: [initials]
4. Comments: ______

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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

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159202 210 REV. 6.08

CHAIN OF CUSTODY

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Sheet 2 of 2

507189

Mailing/Billing Information:

1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:

1. Job Name: Frederick Armory
2. Job Location: Frederick, MD
3. Job #: Frederick Armory
4. Contact Person [redacted] #: W912K6-09-A-0003
5. Submitted by: [redacted] @ [redacted] Signature: [redacted]

AFTER HOURS (must be pre-scheduled)
❑ Immediate Date Due: ______
❑ 24 Hours Time Due: ______
Comments: ______

Reporting Information (Results will be provided as soon as technically feasible):

NORMAL BUSINESS HOURS
❑ Immediate ❑ Next Day ❑ 2 Day ❑ 3 Day ☒ 5 Day +
Date Due: 5-28-10
❑ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Inclu[redacted] with Report
☒ [redacted] bonusenvironmental.com
❑ Fax: [redacted] us.army.mil
❑ Verba[redacted] us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
❑ NIOSH 7400 ______ (QTY)
❑ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
❑ AHERA ______ (QTY)
❑ NIOSH 7402 ______ (QTY)
❑ Other (specify ______) ______ (QTY)
PLM Bulk
❑ EPA 600 – Visual Estimate ______ (QTY)
❑ EPA Point Count ______ (QTY)
❑ NY State Friable 198.1 ______ (QTY)
❑ Grav. Reduction ELAP 198.6 ______ (QTY)
❑ Other (specify ______) ______ (QTY)
MISC
❑ Vermiculite
❑ Asbestos Soil PLM__ (Qual) PLM__ (Quan) PLM/TEM__ (Qual) PLM/TEM__ (Quan)

TEM Bulk
❑ ELAP 198.4/Chatfield ______ (QTY)
❑ NY State PLM/TEM ______ (QTY)
❑ Residual Ash ______ (QTY)
TEM Dust
❑ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
❑ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
❑ Quan. (s/area)Dust D6480-99 ______ (QTY)
TEM Water
❑ Qual. (pres/abs) ______ (QTY)
❑ ELAP 198.2/EPA 100.2 ______ (QTY)
❑ EPA 100.1 ______ (QTY)

☑ All samples received in good condition unless otherwise noted. (TEM Water samples ______ °C)

Metals Analysis
❑ Pb Paint Chip ______ (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 18 (QTY)
☒ Pb Air 3 ______ (QTY)
❑ Pb Soil/Solid ______ (QTY)
❑ Pb TCLP ______ (QTY)
❑ Drinking Water ❑ Pb ______ (QTY) ❑ Cu ______ (QTY) ❑ As ______ (QTY)
❑ Waste Water ❑ Pb ______ (QTY) ❑ Cu ______ (QTY) ❑ As ______ (QTY)
❑ Pb Furnace (Media ______) ______ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
❑ Spore-Trap ______ (QTY) ❑ Surface Vacuum Dust ______ (QTY)
❑ Surface Swab ______ (QTY) ❑ Culturable ID Genus (Media ______) ______ (QTY)
❑ Surface Tape ______ (QTY) ❑ Culturable ID Species (Media ______) ______ (QTY)
❑ Other (Specify ______) ______ (QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
F-W-10	SE Stairwell	5-17	—	4"x4"				X				X				
F-W-11	Rm 119-Kitchen		—					X				X				
F-W-12	Rm 110		—					X				X				
F-W-13	Lobby		—					X				X				
F-W-14	Rm 117		—					X				X				
F-W-15	Rm 102		—					X				X				
F-W-16	Rm 103		—					X				X				
F-W-17	Rm 117		—					X				X				
F-W-18	Rm 116		—					X				X				

CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______
Date/Time: ______ Contact: ______ By: ______

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 5 / 21 / 10 @ 9:45 Via: FedEx By (Print) Surat Watson Sign: [signature]
2. Date/Time Analyzed: __ / __ / __ @ ____ By (Print) ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: __ / __ / __ Time: ______
4. Comments: ______ Initials: ______

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<u>Appendix C</u>

Photographs

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Building exterior, north side entrance

Room 101, Drill Hall/Parade Floor

Room 114, former indoor firing range

Room 119, Kitchen

Room 117, Boiler Room

Room 116, Storage Room

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Building exterior, south side

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Appendix D

References

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1. Department of Defense Instruction (0001) 6055.1, Department of Defense Occupational Safety and Health (OS H) Program, August 19, 1998.

2. Army Regulation (AR) 11-34, The Army Respiratory Protection Program, February 15, 1990.

3. DA PAM 40-503, Medical Service, Industrial Hygiene Program, October 30, 2000.

4. Technical Manual (T.M) 5-810-1, Mechanical Design, Heating, Ventilation, and Air Conditioning, June 1991.

5. Threshold Limit Values (TLVs) and Biological Exposure Indices (BEls), American Conference of Governmental Industrial Hygienists (ACGIH), current edition.

6. Industrial Ventilation - A Manual of Recommended Practices, American Conference of Governmental Industrial Hygienists (ACGIH), current edition.

7. UFC 3-410-01 FA Heating, Ventilating, and Air Conditioning, 15 May 2003

8. Occupational Safety and Health Administration (OSHA) Lead in Construction Standard, 29 CFR 1926.62

9. OSHA Lead Standard 29 CFR 1910.1025

10. OSHA Respiratory Protection Standard 29 CFR 1910.134

11. Army Regulation (AR) 385-10, The Army Safety Program, August 23, 2007.

12. RP-1-2004, Office Lighting, Illuminating Engineering Society of North America (IESNA)/ANSI.

13. RP-7-2001, Industrial Lighting, (IESNA)/ANSI.

14. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Standard 62.1-2007, "Ventilation for Acceptable Indoor Air Quality".

15. ASHRAE Standard 55-2004 – "Thermal Environmental Conditions for Human Occupancy"

16. Title 24, CFR, Part 35, Subpart B, Sections 35.110, Definitions of Lead-Based Paint, Housing and Urban Development, U.S. Department of Housing.

17. OSHA Personal Protective Equipment 29 CFR 1910.132

18. OSHA Permissible Exposure Limit (PEL) for General Industry 29 CFR 1910.1000 Z-1 Table

19. Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Department of Health and Mental Hygiene, November 2008.

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20. Mold Remediation in Schools and Commercial Buildings, U.S. Environmental Protection Agency, March 2001

21. Army Facilities Management Information Document on Mold Remediation Issues TG277, February 2002

22. OSHA Welding, Cutting, Brazing 29 CFR 1910.252

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COMPLIANCE MANAGEMENT INTERNATIONAL

1215 Manor Drive, Suite 205
Mechanicsburg, PA 17055
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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** **8501 Old National Pike** **Frederick MD, 21701**
Prepared By:	**Compliance Management International, Inc.** **1215 Manor Drive** **Suite 205** **Mechanicsburg, PA 17055**
Survey Date:	**January 3, 2013**
Report Date:	**February 18, 2013**

Non-Responsive

[redacted]

Manager, Industrial Hygiene Services

Table of Contents

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. [redacted].

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/ft^2. See Section 3.0 for sampling results.

2. Lighting levels did not meet the American National Standard Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in 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.

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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.

Lead Testing Results Summary

Sample #	Location	Bulk (%)	Air ug/m^3	Surface ug/ft^2
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 Floor**	*****	*****	**340**
11	Converted Indoor Firing Range – Top of Wall 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

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 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 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/ft^2 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/m^3).

- 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.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient 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**

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.

IAQ Assessment Summary

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**

Table Notes:
1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **F =** degrees Fahrenheit

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature 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.

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Section 6.0 Suspect Asbestos Containing Building Materials

Based on the age of the building (e.g., constructed in 1982) it is unlikely asbestos-containing 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.

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Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	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

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Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

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Appendix A. Laboratory Analysis Report

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Appendix B. Photographs

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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. 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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IES ENGINEERS

1720 Walton Road Blue Bell, PA 19422 610-828-3078 Fax 610-828-7842

February 9, 2009

E-MAIL
Ms. [redacted]
Army National Guard
ATTN: NGB-ARS-IHNE
301-IH Old Bay Lane
Havre de Grace, MD 21078

Subject: Industrial Hygiene Assessment Report
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 [redacted] or me.

Sincerely,

[redacted] CIH
Senior Manager, Health, Safety
& Industrial Hygiene Services

cc: [redacted], IES

IES ENGINEERS

NATIONAL GUARD BUREAU
REGION NORTH INDUSTRIAL HYGIENE OFFICE
HAVRE DE GRACE, MARYLAND

FINAL
INDUSTRIAL HYGIENE ASSESSMENT
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:

[redacted] /e/

[redacted], CIH
Senior Project Manager

Certified Industrial Hygienist review by:

[redacted] /e/

[redacted], CIH
Senior Manager, Health, Safety & Industrial Hygiene Services

ENGINEERS

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TABLES

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IES ENGINEERS

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APPENDICES

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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. [redacted], 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 [redacted], Administrative Supervisor, Fort Ritchie Readiness Center

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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 [redacted]. [redacted] and [redacted]). Additionally, one full-time Caretaker ([redacted]) provides routine maintenance and custodial service. Occasionally, other military/national guard personnel may be temporarily assigned to this location. M-Day National Guard personnel occupy the site on drill weekends.

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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.

  <u>HVAC Service</u>
- Heating, ventilating and air-conditioning (HVAC) service was found to be largely non-functional 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.

  <u>Facility Condition</u>
- 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.

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- 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.

<u>Security</u>

- Facility security may be limited. The front door is propped open during summer months. The boiler room was found unlocked.

<u>Other Ventilation</u>

- The exhaust fans were found non-functional in the men’s room locker area.

<u>EH&S Compliance & Support</u>

- 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

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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."

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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. [redacted], Senior Project Manager of IES during and subsequent to the survey period, as coordinated by SSG [redacted], 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

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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 (CO_2), 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

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(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, CO_2, 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 1
AIR TEMPERATURE, RELATIVE HUMIDITY, CO_2, AND CO MEASUREMENTS

Location: Ft. Ritchie National Guard RC (Edgar Boyd Armory), Cascade, Maryland
Date: July 16, 2008

Sample Location ID	Sample Location/Description	Sample Time	CO_2 (ppm)	CO (ppm)	Temperature (°F)	Relative Humidity (%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.

ppm Parts per million contaminant in air. All CO_2 and CO concentrations expressed in ppm.

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Exposure Guidelines

CO_2	Indoor CO_2 concentrations should be maintained at less than 700 ppm above outdoor air levels – (ASHRAE 62.1-2007)[2]
CO	50 ppm (OSHA PEL-TWA); 25 ppm (ACGIH TLV-TWA)
Temperature	68 ºF to 79 ºF (ASHRAE 55-2004)[3]
Relative Humidity	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-µm 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 ($\mu g/m^3$) 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: Ft. Ritchie National Guard RC (Edgar Boyd Armory), Cascade, Maryland
Date: July 16, 2008

Sample ID	Equipment ID	Sample Description	Start Time	End Time	Sample Time (Minutes)	Flow Rate (lpm)	Air Volume (L)	Lead Sample Result (mg/m3)
FR-01	IES-105	**SSG** [redacted] – Personal Breathing Zone Sample; during routine administrative duties within the Ft. Ritchie Armory.	0825 1400	1201 1700	396	1.99	788	<0.0038
FR-02	IES-BFE-1272-96	**SSG** [redacted] – Personal Breathing Zone Sample, During routine administrative duties within the Ft. Ritchie Armory.	0827	1202	216*	1.97	425	<0.0071

* 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 media
Mg/m3	Milligrams per cubic meter air. Sample results expressed in milligrams contaminant per cubic meter of air.

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Occupational Exposure Limits	OSHA Permissible Exposure Limit, 8-hour time-weighted average (PEL-TWA) = 0.05 mg/m^3; OSHA Action Limit-TWA = 0.03 mg/m^3 **NOTE: Due to workshift duration of 10 hours, all sample results must be interpreted in relation to an adjusted OSHA PEL-TWA of 40 µg/m^3.** Refer to the OSHA Lead Standard at 29 CFR 1910.1025 for details of the OSHA compliance requirements. ACGIH TLV-TWA= 0.05 mg/m^3

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 (µg/ft^2) for the purposes of this assessment, and for subsequent comparison with OSHA guideline criteria of 200 µg/ft^2.

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.

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TABLE 3 – WIPE/BULK SAMPLE RESULTS SUMMARY

Location: Ft. Ritchie National Guard RC (Edgar Boyd Armory), Cascade, Maryland
Date: July 16, 2008

Sample ID	Location	Surface Area Sampled	Lead Surface Concentration ($\mu g/ft^2$)
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, <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 procedure: Wipe sample collected with nitrile glove donned on hand, using "Ghost Wipe" towlette, by sequential wipe using template or best estimate of 100 cm^2 area; multiple passes with clean surface of wipe and subsequent folding, and placement to a labeled, sealed plastic vial or bag.

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 guideline standard for surface contamination by lead The USDOL/OSHA does not have a promulgated standard for lead surface contamination; however, OSHA has provided an interpretive level of 200 ug/ft^2 to assess the housekeeping requirement of "as free as reasonably practicable". This interpretation is presented in OSHA Industrial Hygiene Technical Manual (TED 01-00-0150; 1/20/1999), and in a letter of interpretation dated 01/13/2003, and subsequently issued into public domain.

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3.3 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, Maryland
Date: 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	**Sg[redacted] 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
I5	**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, ½ 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)

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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.

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TABLE 5
SAMPLING EQUIPMENT LIST

Equipment Type	Make/Model	Equipment/Serial Number	Equipment Identification
Personal Sampling Pump	MSA Escort ELF	IES-105	IES-105
Personal Sampling Pump	MSA Escort ELF	BFE-1272-96	IES-BFE-1272-96
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 6
SAMPLING EQUIPMENT CALIBRATION DATA

Equipment ID	Calibrator Used	Date of Pre-Sampling Calibration	Pre-Sampling Calibration Value (lpm)	Date of Post-Sampling Calibration	Post-Sampling Calibration Value (lpm)	Average Calibration Value (lpm)
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*.
2. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), Standard 62-2007, "Ventilation for Acceptable Indoor Air Quality," ASHRAE, Atlanta, Georgia, 2004.
3. American Society of Heating, 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.

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APPENDIX A

READINESS CENTER PHOTOGRAPHS

Photograph #1 – RC General Construction Features, Indoors,
on careful inspection-ceiling tile warpage due to ambient humidity

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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

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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

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Photographs #15,16 – Boiler Rm, boiler and hot water heater

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APPENDIX B

INDOOR AIR QUALITY MAP

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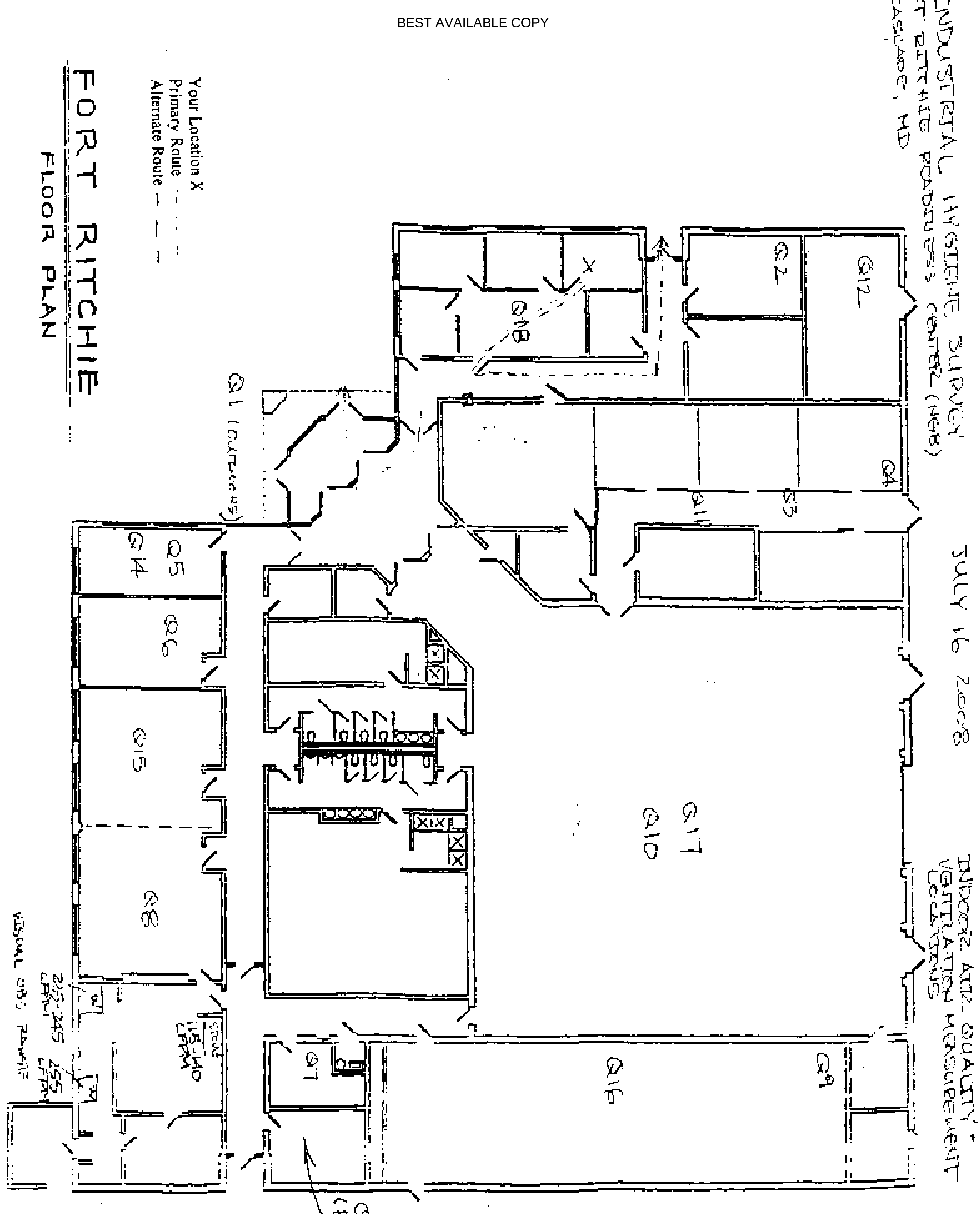

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APPENDIX C

LABORATORY ANALYSIS RESULTS

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCREDITED LABORATORY AIHA Environmental Lead See aihaloap.org for details
100470
NY ELAP
10920

Client:	National Guard Bureau	**Job Name:**	National Guard Bureau	**Chain Of Custody:**	503036
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	8/7/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EHS 08794.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	8/11/2008

Report Date: 8/11/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Final Result	Comments
0875728	FR-W01	Flame	Wipe	****	0.108	111.52 ug/ft²	110 ug/ft²	
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 for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.
Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accrediation applies only to paint chip, wipe, and water samples.

Analyst: Melissa Sampson **Technical Manager:** G Edward Carney

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.

AMA Analytical Services, Inc.
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To T. Number For Inquiri... **503036**

BILL THE NATIONAL GUARD BUREAU REGION NORTH IH OFFICE DIRECTLY.

Mailing/Billing Information:
1. Client Name: IES ENGINEERS
2. Address 1: 1720 WALTON RD
3. Address 2: BLUE BELL PA 19422
4. Address 3:
5. Phone #: Fax #:

Submittal Information:
1. Job Name: NATL GUARD BUREAU
2. Job Location:
3. Job #: EHS 08794.02 P.O. #:
4. Contact Pe[redacted]
5. Submitted [redacted] 8

[redacted] ERS

Reporting Information (Results will be provided as soon as technically feasibl[redacted]

AFTER HOURS (must be prescheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day
☐ 2 Day Date Due: 8/14/08
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Includ[redacted] with Report
☒ Emai[redacted] @iesengineers.com
☐ Fax:
☐ Verbals:

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)

TEM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify____) ____ (QTY)

PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify____) ____ (QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)

TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area) Dust D6480-99 ____ (QTY)

TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted.
☐ TEM Water samples ____ °C

Lead Analysis
☒ Paint Chip ____ (QTY)
☒ Dust Wipe (wipe type Ghost wipe) 1 (QTY)
☐ Air ____ (QTY)
☐ Soil/Solid Bulk ____ (QTY)
☐ TCLP ____ (QTY)
☐ Drinking Water ____ (QTY)
☐ Waste Water ____ (QTY)
☐ Dust Wipe Furnace (wipe type ____) ____ (QTY)

Mold - Direct Microscopic Analysis
☐ Spore Trap ____ (QTY) ☐ Bulk ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Other (Specify____) ____ (QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
FR-W01	HVAC S1 EVAP			100 cm²				✓				✓				
FR-W02	HVAC S1 BLR			1 ft²				✓								
FR-W03	HVAC S2 COND			100 cm²				✓			✓	~~✓~~				

This sample is a bulk material

7/16/...

CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: 8/8/8 Contact: TJ Derr By: GCL
FR-W03 - is a bulk sample

Date/Time: Contact: By:

Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 8/07/08 0950 Via: FedEx By (Print): Chris Nicodin Sign: Chris Nicodin
2. Date/Time Analyzed: __/__/__ @ __ By (Print): Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

LAB CONTACT > [redacted] / AMA ANALYTICAL SERVICES, INC.

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCREDITED LABORATORY AIHA Environmental Lead See aihaLAP.org for details

100470

NY ELAP

10920

Client:	National Guard Bureau	**Job Name:**	National Guard Bureau	**Chain Of Custody:**	503036
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Not Provided	**Date Submitted:**	8/7/2008
	Havre de Grace, Maryland 21078	**Job Number:**	EHS 08794.02	**Person Submitting:**	Non-Responsive [redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	8/11/2008
				Report Date:	8/11/2008

Attention: Non-Responsive [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments
0875728	FR-W01	Flame	Wipe	****	0.108	111.52 ug/ft²	110 ug/ft²	
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 for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)

%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these sampes.

NY ELAP accrediation applies only to paint chip, wipe, and water samples.

Analyst: Melissa Sampson **Technical Manager:** G Edward Carney

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CHAIN OF CUSTODY

(Please Refer To T. Number For Inquir.) **503036**

BILL THE NATIONAL GUARD BUREAU REGION NORTH IH OFFICE DIRECTLY.

Mailing/Billing Information:
1. Client Name: IES ENGINEERS
2. Address 1: 1720 WALTON RD
3. Address 2: BLUE BELL PA 19422
4. Address 3:
5. Phone #: Fax #:

Submittal Information:
1. Job Name: NATL GUARD BUREAU
2. Job Location:
3. Job #: EHS 08794.02 P.O. #:
4. Contact Pe[redacted]
5. Submitted [redacted] 8

Reporting Information (Results will be provided as soon as technically feasibl[redacted]ERS

AFTER HOURS (must be prescheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☐ Next Day ☒ 5 Day
☐ 2 Day Date Due: 8/14/08

☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Inclu[redacted]s with Report
☒ Emai[redacted] @iesengineers.com
☐ Fax:
☐ Verbals:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity_____ in a 25mm 37mm
☐ NIOSH 7400_______(QTY)
☐ Fiberglass_______(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity_____ in a 25mm 37mm
☐ AHERA_______(QTY)
☐ NIOSH 7402_______(QTY)
☐ Other (specify_______)_______(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate_______(QTY)
☐ EPA Point Count_______(QTY)
☐ NY State Friable 198.1_______(QTY)
☐ Grav. Reduction ELAP 198.6_______(QTY)
☐ Other (specify_______)_______(QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield_______(QTY)
☐ NY State PLM/TEM_______(QTY)
☐ Residual Ash_______(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust_______(QTY)
☐ Quan. (s/area) Vacuum D5755-95_______(QTY)
☐ Quan. (s/area)Dust D6480-99_______(QTY)
TEM Water
☐ Qual. (pres/abs)_______(QTY)
☐ ELAP 198.2/EPA 100.2_______(QTY)
☐ EPA 100.1_______(QTY)

☒ All samples received in good condition unless otherwise noted.
TEM Water samples _____°C

Lead Analysis
☒ Paint Chip_______(QTY)
☒ Dust Wipe (wipe type Ghost Wipe) 1 (QTY)
☐ Air_______(QTY)
☑ Soil/Solid Bulk_______(QTY)
☐ TCLP_______(QTY)
☐ Drinking Water_______(QTY)
☐ Waste Water_______(QTY)
☐ Dust Wipe Furnace (wipe type_______)_______(QTY)

Mold - Direct Microscopic Analysis
☐ Spore Trap_____(QTY) ☐ Bulk_____(QTY)
☐ Surface Swab_____(QTY) ☐ Surface Vacuum Dust_____(QTY)
☐ Surface Tape_____(QTY) ☐ Other (Specify_____)_____(QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
FR-W01	HVAC S1 EVAP			100cm²				✓				✓				
FR-W02	HVAC S1 FILT			1ft²				✓				✓				
FR-W03	HVAC S2 COND			100cm²				✓			✓	~~✓~~				

This sample is a bulk material

7/16/(?)

CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: 8/8/8 Contact: T Derr By: GC
FR-W03 - is a bulk sample
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 8/07/08 0950 Via: FedEx By (Print): Chris Nicodem Sign: Chris Nicodem
2. Date/Time Analyzed: ___/___/___ @_____ By (Print): Sign:
3. Results Reported To: Via: Date: ___/___/___ Time: Initials:
4. Comments:

LAB CONTACT > [redacted] AMA ANALYTICAL SERVICES, INC.

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

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ACCREDITED LABORATORY AIHA Environmental Lead See aihaloap.org for details
100470
NY ELAP
10920

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
	Havre de Grace, Maryland 21078	**Job Number:**	EHS 08794.02	**Person Submitting:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	8/1/2008
Attention:	[redacted]			**Report Date:**	8/1/2008

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit		Final Result			Comments
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/m³	
0874218	FR-03	Flame	Air Blank	0	N/A	3.00	ug/m³	<	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/ft²	
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/ft²	<	110	ug/ft²	
0874225	FR-W10	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
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/ft²		130	ug/ft²	
0874229	FR-W14	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874230	FR-W15	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
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/ft²	
0874233	FR-W18	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	
0874234	FR-W19	Flame	Wipe	****	0.108	111.52	ug/ft²	<	110	ug/ft²	

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A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

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ACCREDITED LABORATORY AIHA Environmental Lead See aihalpap.org for details

100470

NY ELAP

10920

Client:	National Guard Bureau	**Job Name:**	Natl Guard Bureau	**Chain Of Custody:**	503007		
Address:	301-JH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Ft. Richie MD	**Date Submitted:**	7/31/2008		
	Havre de Grace, Maryland 21078	**Job Number:**	EHS 08794.02	**Person Submitting:**	Non-Responsive [redacted]		
		P.O. Number:	Not Provided	**Date Analyzed:**	8/1/2008	**Report Date:**	8/1/2008
Attention:	Non-Responsive [redacted]						

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B
N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)
%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)
Note: All samples were received in good condition unless otherwise noted.
Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.
Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these sampes.
NY ELAP accrediation applies only to paint chip, wipe, and water samples.

Analyst: Melissa Sampson

Technical Manager: G Edward Carney

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www.amalab.com

CHAIN OF CUSTODY

(Please Refer To Number For Inqui **503007**

BILL THE NATIONAL GUARD BUREAU REGION NORTH IH OFFICE DIRECTLY.

Mailing/Billing Information:
1. Client Name: IES ENGINEERS
2. Address 1: 1720 WALTON RD
3. Address 2: BLUE BELL PA 19422
4. Address 3:
5. Phone #: Fax #:

Submittal Information:
1. Job Name: NATL GUARD BUREAU
2. Job Location: FT. RITCHIE MD
3. Job #: EHS 08794.02 P.O. #:
4. Contact Per[redacted] @ phone # 610 828-3078
5. Submitted b[redacted] INEERS

Reporting Information (Results will be provide[redacted]ble):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☑ 5 Day + Date Due: ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☐ Inclu[redacted]eets with Report ☐ Emai[redacted] @ iesengineers.com ☐ Fax: ☐ Verbals:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ NIOSH 7400 ____(QTY)
☐ Fiberglass ____(QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity____ in a 25mm 37mm
☐ AHERA ____(QTY)
☐ NIOSH 7402 ____(QTY)
☐ Other (specify____) ____(QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____(QTY)
☐ EPA Point Count ____(QTY)
☐ NY State Friable 198.1 ____(QTY)
☐ Grav. Reduction ELAP 198.6 ____(QTY)
☐ Other (specify____) ____(QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ____(QTY)
☐ NY State PLM/TEM ____(QTY)
☐ Residual Ash ____(QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____(QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____(QTY)
☐ Quan. (s/area) Dust D6480-99 ____(QTY)
TEM Water
☐ Qual. (pres/abs) ____(QTY)
☐ ELAP 198.2/EPA 100.2 ____(QTY)
☐ EPA 100.1 ____(QTY)

☑ All samples received in good condition unless otherwise noted. (TEM Water samples ____°C)

Lead Analysis
☒ Paint Chip 1 (QTY)
☒ Dust Wipe (wipe type ____) ____(QTY) RS 15
☒ Air 3 (QTY)
☐ Soil/Solid ____(QTY)
☐ TCLP ____(QTY)
☐ Drinking Water ____(QTY)
☐ Waste Water ____(QTY)
☐ Dust Wipe Furnace (wipe type ____) ____(QTY)

Mold - Direct Microscopic Analysis
☐ Spore-Trap ____(QTY) ☐ Bulk ____(QTY)
☐ Surface Swab ____(QTY) ☐ Surface Vacuum Dust ____(QTY)
☐ Surface Tape ____(QTY) ☐ Other (Specify ____) ____(QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
FR-01	Boncella	7/16/08	788					✓		✓						
FR-02	Deprenda	7/16/08	424					✓		✓						
FR-03	F/Blank	7/16/08	—					✓		✓						

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 7/29/08 0930 Via: Fed Ex By (Print): Chris Niccolm? Sign: [signature]
2. Date/Time Analyzed: / / @ By (Print): Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

LAB CONTACT > [redacted] / AMA ANALYTICAL SERVICES, INC.

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BILL THE NATIONAL GUARD BUREAU REGION NORTH IH OFFICE DIRECTLY.

Mailing/Billing Information:

1. Client Name: IES ENGINEERS
2. Address 1: 1720 WALTON RD
3. Address 2: BLUE BELL PA 19422
4. Address 3:
5. Phone #: Fax #:

Submittal Information:

1. Job Name: NAT'L GUARD BUREAU
2. Job Location:
3. Job #: EHS 08794.02 P.O. #:
4. Contact Pers[redacted] 610 828-3078
5. Submitted by [redacted] INEERS

Reporting Information (Results will be provided [redacted] **):**

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ Immediate Date Due: ❑ 24 Hours Time Due: Comments:	❑ Immediate ❑ Next Day ❑ 2 Day ❑ 3 Day ❑ 5 Day + Date Due: ❑ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	❑ Include COC/Field Data Sheets with Report ❑ Email: @ ❑ Fax: ❑ Verbals:

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
❑ NIOSH 7400 ____ (QTY)
❑ Fiberglass ____ (QTY)

TEM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
❑ AHERA ____ (QTY)
❑ NIOSH 7402 ____ (QTY)
❑ Other (specify ____) ____ (QTY)

PLM Bulk
❑ EPA 600 – Visual Estimate ____ (QTY)
❑ EPA Point Count ____ (QTY)
❑ NY State Friable 198.1 ____ (QTY)
❑ Grav. Reduction ELAP 198.6 ____ (QTY)
❑ Other (specify ____) ____ (QTY)

TEM Bulk
❑ ELAP 198.4/Chatfield ____ (QTY)
❑ NY State PLM/TEM ____ (QTY)
❑ Residual Ash ____ (QTY)

TEM Dust
❑ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
❑ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
❑ Quan. (s/area) Dust D6480-99 ____ (QTY)

TEM Water
❑ Qual. (pres/abs) ____ (QTY)
❑ ELAP 198.2/EPA 100.2 ____ (QTY)
❑ EPA 100.1 ____ (QTY)

❑ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Lead Analysis
❑ Paint Chip ____ (QTY)
❑ Dust Wipe (wipe type ____) ____ (QTY)
❑ Air ____ (QTY)
❑ Soil/Solid ____ (QTY)
❑ TCLP ____ (QTY)
❑ Drinking Water ____ (QTY)
❑ Waste Water ____ (QTY)
❑ Dust Wipe Furnace (wipe type ____) ____ (QTY)

Mold - Direct Microscopic Analysis
❑ Spore-Trap ____ (QTY) ❑ Bulk ____ (QTY)
❑ Surface Swab ____ (QTY) ❑ Surface Vacuum Dust ____ (QTY)
❑ Surface Tape ____ (QTY) ❑ Other (Specify ____) ____ (QTY)

Samples Not

OFR / ROOF EXH VENT

CLIENT ID NUMBER	SAMPLE INFORMATION: SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
PR-WØ1	HVAC S1 EVAP			100cm²				✓				✓				
WØ2	HVAC S1 FILT											✓				
WØ3	HVAC S2 COND											✓				
WØ4	W/L RR CEILING										✓					
WØ5	~~OFFICE 115 TOP~~											✓				
WØ6	OFFICE 115											✓				
WØ7	ADM OFFICE	10/1/08										✓				
WØ8	RM 108 SV											✓				
WØ9	FOYER											✓				
W10	E/R RET UV											✓				
W11	CHOW SUV											✓				

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: / / @ Via: By (Print): Sign:
2. Date/Time Analyzed: / / @ By (Print): Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

LAB CONTACT: [redacted] / AMA ANALYTICAL SERVICES, INC.

AMA Analytical Services, Inc.
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

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CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 5j3C07

BILL THE NATIONAL GUARD BUREAU REGION NORTH IH OFFICE DIRECTLY.

Mailing/Billing Information:

1. Client Name: IES ENGINEERS
2. Address 1: 1720 WALTON RD
3. Address 2: BLUE BELL PA 19422
4. Address 3: ______
5. Phone #: ______ Fax #: ______

Submittal Information:

1. Job Name: NATL GUARD BUREAU
2. Job Location: ______
3. Job #: EHS 08794.07 P.O. # ______
4. Contact Pers[redacted] @ phone # 610 828-3078
5. Submitted b[redacted] Si[redacted] ENGINEERS

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ______ ☐ 24 Hours Time Due: ______ Comments: ______	☐ Immediate ☐ 3 Day ☐ Next Day ☐ 5 Day + ☐ 2 Day Date Due: ______ ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☐ Include COC/Field Data Sheets with Report ☐ Email: ______ @ ______ ☐ Fax: ______ ☐ Verbals: ______

Asbestos Analysis

PCM Air - Please Indicate Filter Type:
PC MCE Porosity ______ in a 25mm 37mm
☐ NIOSH 7400 ______ (QTY)
☐ Fiberglass ______ (QTY)

TEM Air - Please Indicate Filter Type:
PC MCE Porosity ______ in a 25mm 37mm
☐ AHERA ______ (QTY)
☐ NIOSH 7402 ______ (QTY)
☐ Other (specify ______) ______ (QTY)

PLM Bulk
☐ EPA 600 – Visual Estimate ______ (QTY)
☐ EPA Point Count ______ (QTY)
☐ NY State Friable 198.1 ______ (QTY)
☐ Grav. Reduction ELAP 198.6 ______ (QTY)
☐ Other (specify ______) ______ (QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ______ (QTY)
☐ NY State PLM/TEM ______ (QTY)
☐ Residual Ash ______ (QTY)

TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
☐ Quan. (s/area) Dust D6480-99 ______ (QTY)

TEM Water
☐ Qual. (pres/abs) ______ (QTY)
☐ ELAP 198.2/EPA 100.2 ______ (QTY)
☐ EPA 100.1 ______ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ______ °C)

Lead Analysis
☐ Paint Chip ______ (QTY)
☐ Dust Wipe (wipe type ______) ______ (QTY)
☐ Air ______ (QTY)
☐ Soil/Solid ______ (QTY)
☐ TCLP ______ (QTY)
☐ Drinking Water ______ (QTY)
☐ Waste Water ______ (QTY)
☐ Dust Wipe Furnace (wipe type ______) ______ (QTY)

Mold - Direct Microscopic Analysis
☐ Spore Trap ______ (QTY) ☐ Bulk ______ (QTY)
☐ Surface Swab ______ (QTY) ☐ Surface Vacuum Dust ______ (QTY)
☐ Surface Tape ______ (QTY) ☐ Other (Specify ______) ______ (QTY)

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
FR-W12	KITCHEN SV	7/10/08		100cm²				✓				✓					Date/Time: Contact: By:
FR-W13	PACK RM RV											✓					
FR-W14	PACK RM CAB											✓					
FR-W15	DRILL RM											✓					
FR-W16	DRILL RM											✓					Date/Time: Contact: By:
FR-W17	DRILL RM											✓					
FR-W18	SST - LT TOP											✓					
FR-W19	ORDER RM SV											✓					
																	Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)

1. Date/Time RCVD: ___ / ___ / ___ @ ___ Via: ______ By (Print): ______ Sign: ______
2. Date/Time Analyzed: ___ / ___ / ___ @ ___ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ___ / ___ / ___ Time: ______ Initials: ______
4. Comments:

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LAB CONTACT [redacted] / AMA ANALYTICAL SERVICES, INC.

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APPENDIX D

ILLUMINANCE READING MAP

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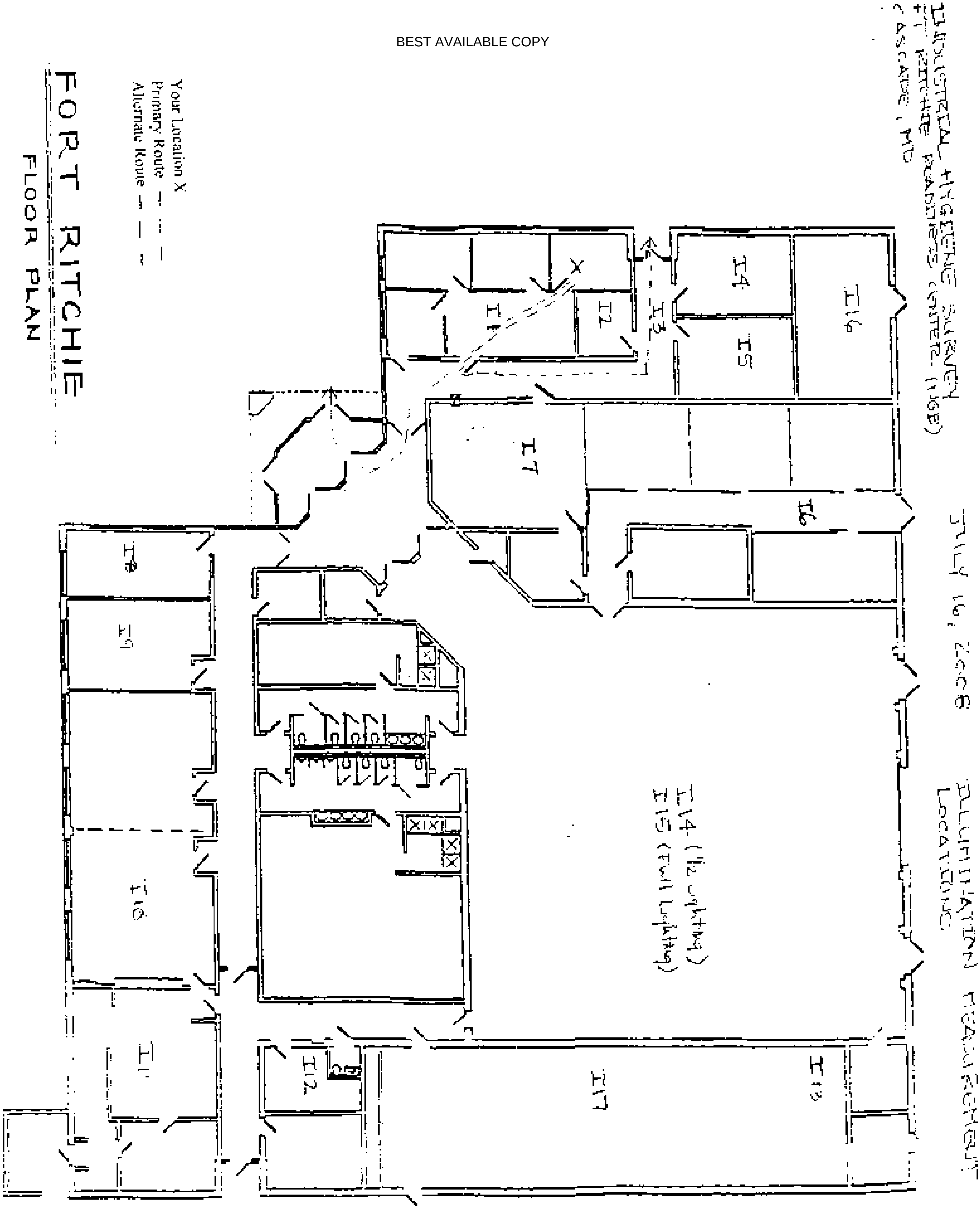

EVACUATION PLAN

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: [redacted]

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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APPENDICES

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August 21, 2010
Project No. 1061-03

National Guard Region North
Industrial Hygiene Office
301 Old Bay Lane
Havre De Grace, MD 21078-4003

Attn: [redacted]

Project: Army National Guard Readiness Center, Industrial Hygiene Evaluation
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 representative [redacted] 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 [redacted]. 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

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hygiene evaluation were sent to the National Guard Bureau Region North Industrial Hygiene Office approved laboratories for analysis.

2.0 – LEAD SAMPLING

2.1 – Lead Wipe Sampling

Lead wipe sampling was performed according to the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame). Twenty (20) wipe samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. The National Guard Bureau Region North Industrial Hygiene Office has established/interpreted a threshold of 200 µg/ft² of lead concentration for surface cleanliness. The following table outlines the locations and analytical results for the lead wipe samples collected during this project

Army National Guard – Fort Ritchie Readiness Center Lead Wipe Sample Results				
Sample #	***Sample Date***	***Sample Location***	***Sample Area (ft^2)***	***Sample Result ($\mu g/ft^2$)***
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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Army National Guard – Fort Ritchie Readiness Center ***Lead Wipe Sample Results***				
Sample #	***Sample Date***	***Sample Location***	***Sample Area (ft^2)***	***Sample Result ($\mu g/ft^2$)***
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 $\mu g/m^3$ or the maximum permissible exposure limit (PEL) of 50 $\mu g/m^3$ as 8-hour time weighted averages (TWAs). If employee exposures are less than 30 $\mu g/m^3$, training is required under the Hazard Communication 29 CFR 1926.59. Exposures that exceed the AL or PEL require the employer to comply with additional requirements, including air monitoring, additional training, and restricted work practices as outlined in OSHA 29 CFR 1926.62.

Representative fixed area sampling was conducted for potential airborne concentrations of lead in accordance with accepted Industrial Hygiene methods recognized by the National Institute for Occupational Safety and Health (NIOSH) and OSHA. Representative breathing zone samples were not collected from an employee performing administrative tasks.

Lead exposure monitoring was performed in accordance with the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame) with SKC personal air sampling pumps calibrated to 2.0 liters per minute. All samples were collected on 37 mm diameter cassettes with mixed-cellulose ester filters. All sampling pumps were calibrated before and after each use to ensure volume accuracy. Two (2) samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. Analytical results of the lead wipe and air samples are attached to this report as Appendix B.

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Army National Guard – Fort Ritchie Readiness Center Lead Air Sample Results									
Sample #	**Sample Type**	**Sample Location**	**Flow Rate**	**Start**	**Stop**	**Vol.**	**Reprt. Limit (µg/m³)**	**Results (µg/m³)**	**8 hr TWA (µg/m³)**
May 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 µg/m³ is averaged over an 8 hr work shift

3.0 - PHYSICAL CONDITION OF FACILITY / PERSONNEL CONCERNS

3.1 - Lead Based Paint

During the industrial hygiene evaluation of the Army National Guard 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.

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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 (CO_2) throughout the facility. A calibrated TSI Q-Trak Model 7565 Indoor Air Quality Monitor equipped with a Q-Trak Probe 982 was utilized to record indoor air quality measurements.

Carbon dioxide is a natural component of air and the amount of CO_2 in a given air sample is commonly expressed as parts per million (ppm). The outdoor air in most locations contains about 380 ppm carbon dioxide. Higher outdoor CO_2 concentrations can be found near vehicle traffic areas, industry and sources of combustion. The concentrations of CO_2 found in most offices are well below the OSHA Permissible Exposure Limit (PEL) of 5,000 ppm when averaged over an 8-hour time period for an industrial workplace. While levels below 5,000 ppm are considered to pose no serious health threat, studies have indicated that individuals in offices with elevated CO_2 concentrations tend to report drowsiness, lethargy and a general sense that the air is stale. Ventilation rates for office spaces are defined by various codes and standards. The most widely accepted standard is the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 62. According to ASHRAE Standard 62.1-2007, CO_2 concentrations below 700 ppm above the outdoor level are considered to indicate adequate ventilation and provide human comfort. The CO_2 measurements collected during this industrial hygiene evaluation ranged from 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

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throughout the facility ranged from 66.1ºF to 68.2ºF 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 Guard – Fort Ritchie Readiness Center ***Indoor Air Quality Measurements***				
Location	*CO_2 (ppm)*	*CO (ppm)*	*Relative Humidity (%)*	*Temperature (ºF)*
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 – Fort Ritchie Readiness Center ***Lighting Survey***			
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

Army National Guard – Fort Ritchie Readiness Center Lighting Survey			
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	Light switch malfunctioning		
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

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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,

Non-Responsive [redacted]
Principal
Bonus Environmental, LLC

Non-Responsive [redacted]
Principal
Bonus Environmental, LLC

Fort Ritchie_10_Report.docx

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May, 2018
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Appendix A

Shop Diagram

Evacuation Plan

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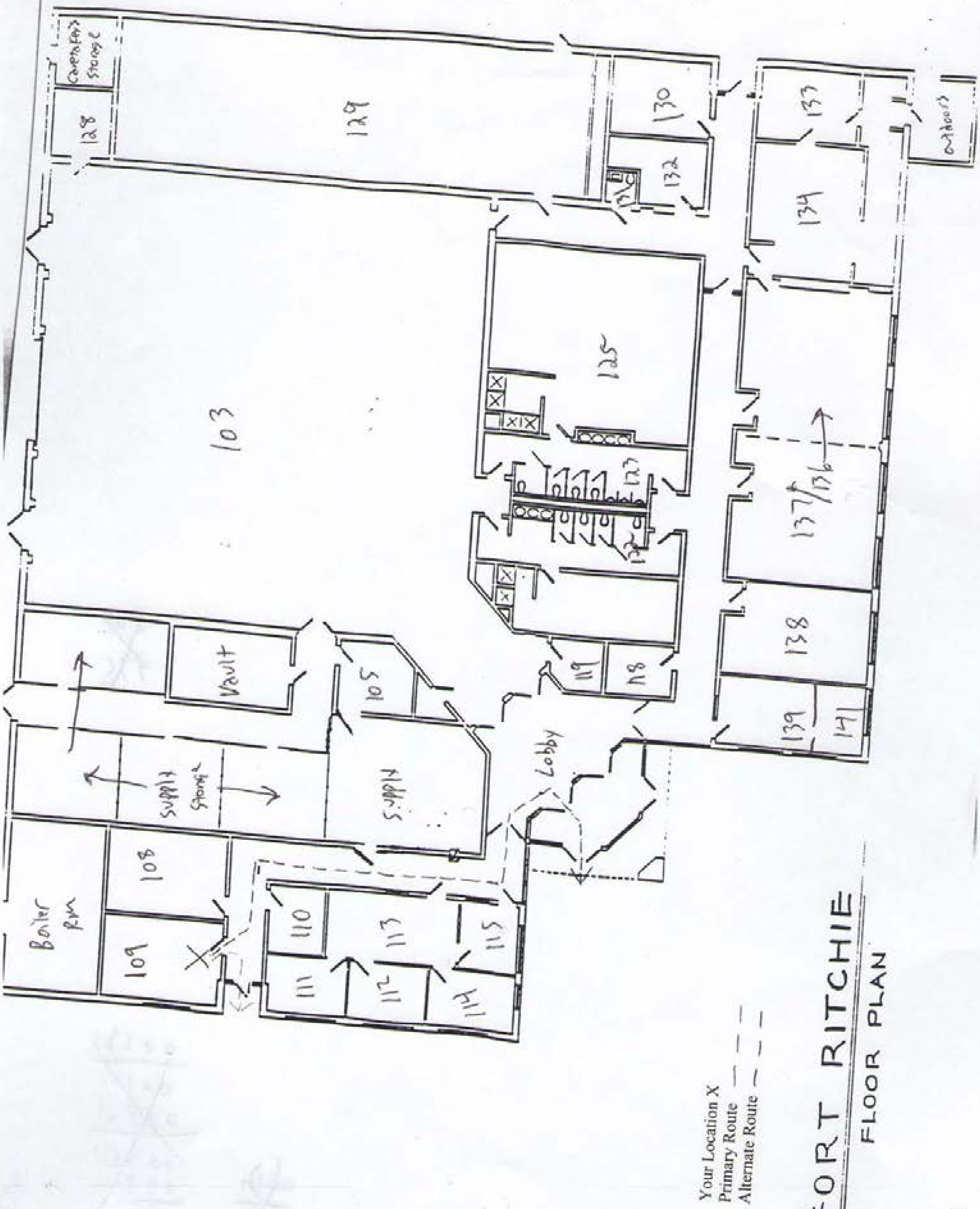

Evacuation Plan

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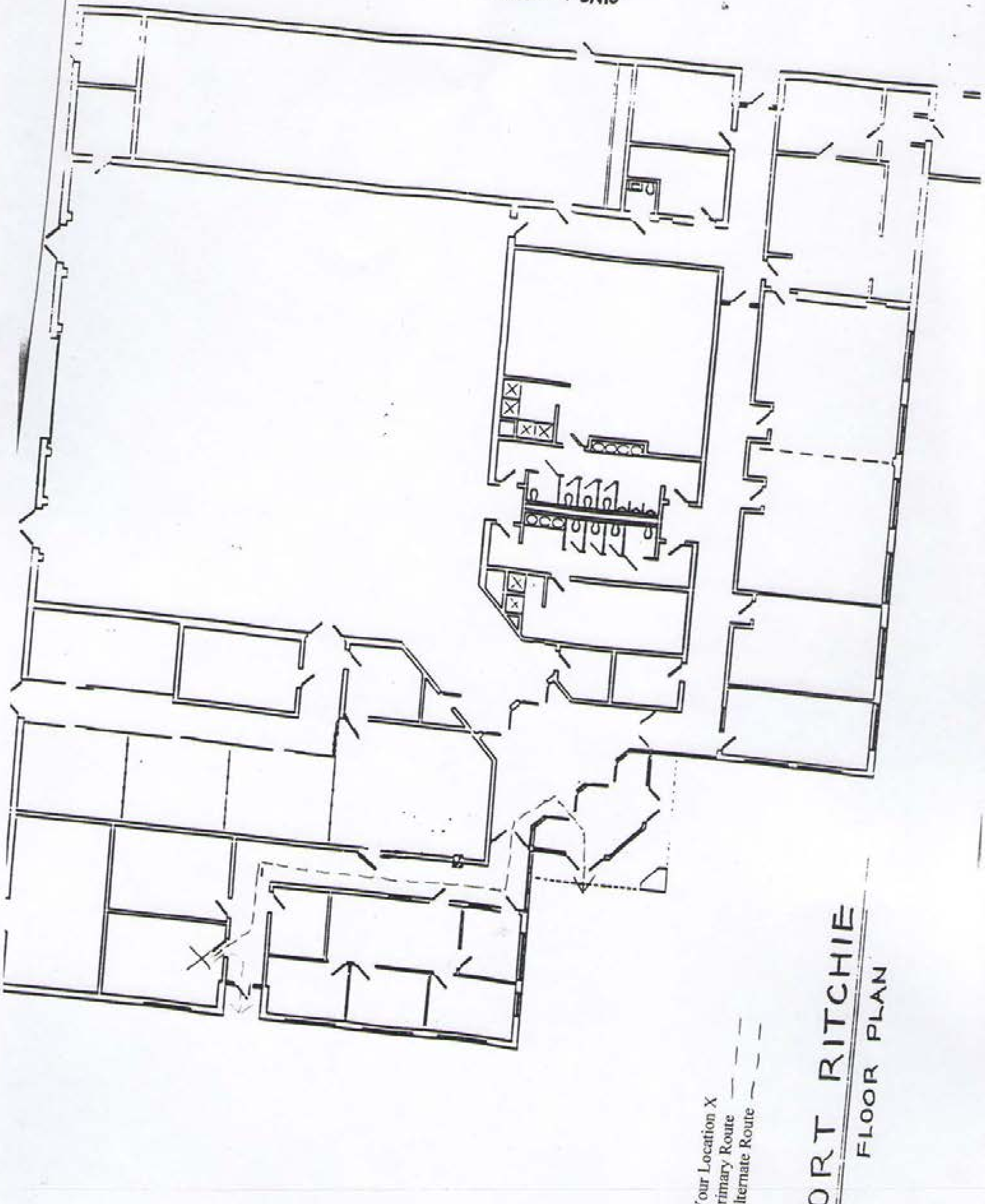

Appendix B

Lead Sample Results

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

RECEIVED JUN 14 2010

AIHA Accredited Laboratory — Environmental Lead — See aihaqap.org for details — 100470

NY ELAP 10920

Client:	National Guard Bureau	**Job Name:**	Fort Ritchie Armory	**Chain Of Custody:**	507188
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	**Job Location:**	Cascade, MD	**Date Submitted:**	5/21/2010
	Havre de Grace, Maryland 21078	**Job Number:**	Fort Ritchie Armory	**Person Submitting:**	[redacted]
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	5/28/2010
Attention:	[redacted]			**Report Date:**	6/1/2010

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments
1047776	FR-A-1	Flame	Air Blank	0	N/A	3 ug/m³		<3 ug	
1047777	FR-A-2	Flame	Air	740	N/A	4.1 ug/m³	<3	<4.1 ug/m³	
1047778	FR-A-3	Flame	Air	736	N/A	4.1 ug/m³	<3	<4.1 ug/m³	
1047779	FR-W-1	Flame	Wipe Blank	****	N/A	12 ug		<12 ug	
1047780	FR-W-2	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047781	FR-W-3	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047782	FR-W-4	Flame	Wipe	****	0.111	110 ug/ft²	13	110 ug/ft²	
1047783	FR-W-5	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047784	FR-W-6	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047785	FR-W-7	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047786	FR-W-8	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047787	FR-W-9	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047788	FR-W-10	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047789	FR-W-11	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047790	FR-W-12	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047791	FR-W-13	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047792	FR-W-14	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047793	FR-W-15	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047794	FR-W-16	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. 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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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA Accredited Laboratory – Environmental Lead – See aihaloap.org for details – 100470

NY ELAP 10920

Client: National Guard Bureau

Address: 301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation, Havre de Grace, Maryland 21078

Attention: [redacted]

Job Name: Fort Ritchie Armory

Job Location: Cascade, MD

Job Number: Fort Ritchie Armory

P.O. Number: W912K6-09-A-0003

Chain Of Custody: 507188

Date Submitted: 5/21/2010

Person Submitting: [redacted]

Date Analyzed: 5/28/2010 **Report Date:** 6/1/2010

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments
1047795	FR-W-17	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047796	FR-W-18	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047797	FR-W-19	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047798	FR-W-20	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	
1047799	FR-W-21	Flame	Wipe	****	0.111	110 ug/ft²	<12	<110 ug/ft²	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)

%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

See QC Summary for analytical results of quality control samples associated with these sampes.

NY ELAP accreditation applies only to paint chip, wipe, and soil samples.

Analyst: Ang Cao

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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FOIA Requested Record #J-15-0035 (MD) Released by National Guard Bureau Page 3007 of 5269

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 19393

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	5/27/2010

		Result		Percent Recovery	RPD	Comment
Preparation Blank		-0.061	ppm			
Report Limit Verification Sample		0.2937	ppm	88.1%		Acceptable
Expected Spike Level (ppm)	0.3333					Acceptable
Duplicate Sample 1						
Duplicate Sample 2			mg/Kg			
Matrix Spike Analysis			mg/Kg			Acceptable
Spiked Sample						
Spike Duplicate						Acceptable
Laboratory Control Sample 1						Acceptable
Laboratory Control Sample 2		160.194	µg	103.29%		Acceptable
		256.311	µg	105.42%	2.04%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.99969

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507188	47779	FR-W-1
507188	47780	FR-W-2

SDG Number: 19393

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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507188	47781	FR-W-3
507188	47782	FR-W-4
507188	47783	FR-W-5
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
507188	47791	FR-W-13
507188	47792	FR-W-14
507188	47793	FR-W-15
507188	47794	FR-W-16
507188	47795	FR-W-17
507188	47796	FR-W-18
507188	47797	FR-W-19
507188	47798	FR-W-20

SDG Number: 19393

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AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 19408

Analysis Type:	Flame
Sample Type:	Air
Analysis Date:	5/28/2010

	Result		Percent Recovery	RPD	Comment
Preparation Blank	-0.075	ppm			Acceptable
Report Limit Verification Sample	0.2114	ppm	84.6%		Acceptable
Expected Spike Level (ppm) 0.25					
Duplicate Sample 1		mg/Kg			
Duplicate Sample 2		mg/Kg			Acceptable
Matrix Spike Analysis					
Spiked Sample					Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample 1	91.418	µg	106.60%		Acceptable
Laboratory Control Sample 2	99.378	µg	107.50%	0.84%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.99992

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507188	47776	FR-A-1
507188	47777	FR-A-2

SDG Number: 19408

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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
507188	47778	FR-A-3
507189	47845	F-A-1
507189	47846	F-A-2
507189	47847	F-A-3
507190	47867	CL-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	52510-JN01
196472	49495	52510-JN02
196472	49496	52610-JN01
196472	49497	52610-JN02
196472	49498	52710-JN01
196472	49499	52710-JN02

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AMA Analytical Services, Inc.

Focused on Results!!

NVLAP
101143-0
NY ELAP
10920
AIHA
100470

Submitting Samples for National Guard Jobs

1) All samples shall be submitted to AMA Analytical Services, Attn: Sample Receiving, utilizing the enclosed Chain-of-Custody Form. The highlighted areas must be completed by the Subcontractor, however, the Sample Information/Analysis/Matrix section will not need to be completed if field date sheets are submitted with the samples. Please be sure to include a contact phone number for the person submitting the samples.
2) Results shall be reported via email to [redacted]ns:
   a. National Guard Subcontractor [redacted] @bonusenvironmental.com
   b. [redacted] CIV NGB: [redacted] us.army.mil
   c. [redacted] CIV NGB: [redacted] rmy.mil
3) Hard Copy Reports & Invoices shall be [redacted] wing manner:
   a. Original Invoices and Copies of Reports shall be sent to the National Guard
      National Guard Bureau
      Attn: [redacted]
      301-IH Old Bay Lane
      Attn: NGB-AVN-SI, State Military Reservation
      Havre de Grace, Maryland 21078
   b. Original Reports shall be sent the National Guard Subcontractor

      ____
      Attn: [redacted]
      office: 989-779-7686
      cell: 989-621-3862
      ____
4) All Pb Wipes shall be handled in the following manner:
   a. All samples shall be analyzed utilizing FLAA procedures
   b. Samples whose results are reported as less than the reporting limit, and the reporting limit is greater than 40ug/ft2 shall be re-analyzed utilizing GFAA procedures.
5) All other samples – Pb Paints, Soils, & Airs, PCM Airs, PLM Bulks, TEM Airs, & TEM Bulks shall be analyzed utilizing standard analytical procedures

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AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

OWI (410) 247-2024

159202

210 REV. 6.08

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

Sheet 1 of 2

507188

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SL State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Fort Ritchie Armory
2. Job Location: Cascade, MD
3. Job #: Fort Ritchie Armory
4. Contact Pers[redacted]#: W912K6-09-A-0003
5. Submitted by[redacted]

AFTER HOURS (must be pre-scheduled)
❑ Immediate Date Due:
❑ 24 Hours Time Due:
Comments:

Reporting Information (Results will be provided as soon as technically feasible):

NORMAL BUSINESS HOURS
❑ Immediate
❑ Next Day
❑ 2 Day
❑ 3 Day
☒ 5 Day + Date Due: 5-28-10
❑ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Inclu[redacted]ith Report
☒ [redacted] bonvsenvironmental.com
❑ Fax: [redacted]us.army.mil
❑ Verba[redacted]@us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
❑ NIOSH 7400 ____(QTY)
❑ Fiberglass ____(QTY)
TEM Air – Please Indicate Filter Type:
❑ AHERA ____(QTY)
❑ NIOSH 7402 ____(QTY)
❑ Other (specify ____) ____(QTY)
PLM Bulk
❑ EPA 600 – Visual Estimate ____(QTY)
❑ EPA Point Count ____(QTY)
❑ NY State Friable 198.1 ____(QTY)
❑ Grav. Reduction ELAP 198.6 ____(QTY)
❑ Other (specify ____) ____(QTY)
MISC
❑ Vermiculite
❑ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
❑ ELAP 198.4/Chatfield ____(QTY)
❑ NY State PLM/TEM ____(QTY)
❑ Residual Ash ____(QTY)
TEM Dust
❑ Qual. (pres/abs) Vacuum/Dust ____(QTY)
❑ Quan. (s/area) Vacuum D5755-95 ____(QTY)
❑ Quan. (s/area)Dust D6480-99 ____(QTY)
TEM Water
❑ Qual. (pres/abs) ____(QTY)
❑ ELAP 198.2/EPA 100.2 ____(QTY)
❑ EPA 100.1 ____(QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples ____°C)

Metals Analysis
❑ Pb Paint Chip ____(QTY)
☒ Pb Dust Wipe (wipe type Ghost) 21 (QTY)
☒ Pb Air 3 (QTY)
❑ Pb Soil/Solid ____(QTY)
❑ Pb TCLP ____(QTY)
❑ Drinking Water ❑ Pb ____(QTY) ❑ Cu ____(QTY) ❑ As ____(QTY)
❑ Waste Water ❑ Pb ____(QTY) ❑ Cu ____(QTY) ❑ As ____(QTY)
❑ Pb Furnace (Media ____) ____(QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
❑ Spore-Trap ____(QTY)
❑ Surface Swab ____(QTY)
❑ Surface Tape ____(QTY)
❑ Other (Specify ____) ____(QTY)
❑ Surface Vacuum Dust ____(QTY)
❑ Culturable ID Genus (Media ____) ____(QTY)
❑ Culturable ID Species (Media ____) ____(QTY)

SAMPLE INFORMATION

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WASH AND OTHER	SPORE TRAP	TAPE	SWAB
FR-A-1	Field Blank	5-20	0	—				X		X						
FR-A-2	Rm 113		740	—				X		X						
FR-A-3	Rm 103		736	—				X		X						
FR-W-1	Field Blank		—	—				X				X				
FR-W-2	Drill Hall		—	—				X				X				
FR-W-3	Drill Hall		—	4"x4"				X				X				
FR-W-4	Drill Hall		—					X				X				
FR-W-5	Drill Hall		—					X				X				
FR-W-6	Drill Hall		—					X				X				
FR-W-7	Rm 129		—					X				X				
FR-W-8	Rm 129		—					X				X				
FR-W-9	Rm 129		—					X				X				

CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 5 / 21 / 10 @ 9:45 Via: FedEx By (Print) Surat Watson Sign: [signature]
2. Date/Time Analyzed: ___ / ___ / ___ @ ___ By (Print): Nidhi Sign:
3. Results Reported To: ____
4. Comments: ____ Via: Mail Date: 6 / 1 / 10 Time: 1906 Initials: NM

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AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

OWI (410) 247-2024

159202

210 REV. 6.08

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 507188

Sheet 2 of 2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-AVN-SI, State Military Reservation
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Fort Ritchie Armory
2. Job Location: Cascade, MD
3. Job #: Fort Ritchie Armory
4. Contact Perso[redacted] #: W912K6-09-A-0003
5. Submitted by: [redacted] 0273
Signature:

AFTER HOURS (must be pre-scheduled)
❑ Immediate Date Due: ______
❑ 24 Hours Time Due: ______
Comments: ______

Reporting Information (Results will be provided as soon as technically feasible):

NORMAL BUSINESS HOURS
❑ Immediate
❑ Next Day
❑ 2 Day
❑ 3 Day
☒ 5 Day +
Date Due: 5-28-10
❑ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

☒ Includ[redacted]
☒ [redacted]
❑ Fax: [redacted]
❑ Verbal [redacted]
[redacted] RT TO:
with Report
@bonvsenvironmental.com
@us.army.mil
@us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
❑ NIOSH 7400 ______ (QTY)
❑ Fiberglass ______ (QTY)
TEM Air – Please Indicate Filter Type:
❑ AHERA ______ (QTY)
❑ NIOSH 7402 ______ (QTY)
❑ Other (specify ______) ______ (QTY)
PLM Bulk
❑ EPA 600 – Visual Estimate ______ (QTY)
❑ EPA Point Count ______ (QTY)
❑ NY State Friable 198.1 ______ (QTY)
❑ Grav. Reduction ELAP 198.6 ______ (QTY)
❑ Other (specify ______) ______ (QTY)
MISC
❑ Vermiculite
❑ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
❑ ELAP 198.4/Chatfield ______ (QTY)
❑ NY State PLM/TEM ______ (QTY)
❑ Residual Ash ______ (QTY)
TEM Dust
❑ Qual. (pres/abs) Vacuum/Dust ______ (QTY)
❑ Quan. (s/area) Vacuum D5755-95 ______ (QTY)
❑ Quan. (s/area) Dust D6480-99 ______ (QTY)
TEM Water
❑ Qual. (pres/abs) ______ (QTY)
❑ ELAP 198.2/EPA 100.2 ______ (QTY)
❑ EPA 100.1 ______ (QTY)

☑ All samples received in good condition unless otherwise noted.
(TEM Water samples ______ °C)

Metals Analysis
❑ Pb Paint Chip ______ (QTY)
☒ Pb Dust Wipe (wipe type Ghost ______) 21 (QTY)
☒ Pb Air 3 ______ (QTY)
❑ Pb Soil/Solid ______ (QTY)
❑ Pb TCLP ______ (QTY)
❑ Drinking Water ❑ Pb ____ (QTY) ❑ Cu ____ (QTY) ❑ As ____ (QTY)
❑ Waste Water ❑ Pb ____ (QTY) ❑ Cu ____ (QTY) ❑ As ____ (QTY)
❑ Pb Furnace (Media ______) ______ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ______
Collection Media ______
❑ Spore-Trap ______ (QTY)
❑ Surface Swab ______ (QTY)
❑ Surface Tape ______ (QTY)
❑ Other (Specify ______) ______ (QTY)
❑ Surface Vacuum Dust ______ (QTY)
❑ Culturable ID Genus (Media ______) ______ (QTY)
❑ Culturable ID Species (Media ______) ______ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
FR-W-10	Hallway outside RA	5-20	—	4"x4"				X				X				
FR-W-11	HVAC-Fan Side		—					X				X				
FR-W-12	HVAC-Filter Side		—					X				X				
FR-W-13	Rm 134		—					X				X				
FR-W-14	Boiler Rm		—					X				X				
FR-W-15	Supply Rm		—					X				X				
FR-W-16	Rm 113		—					X				X				
FR-W-17	Rm 138		—					X				X				
FR-W-18	Rm 136		—					X				X				
FR-W-19	Lobby		—					X				X				
FR-W-20	Rm 118		—					X				X				
FR-W-21	Rm 132		—					X				X				

CLIENT CONTACT
(LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 5 / 21 / 10 @ 9:45 Via: FedEx By (Print): Sarah Watson Sign: [signature]
2. Date/Time Analyzed: ___ / ___ / ___ @ ___ By (Print): ______ Sign: ______
3. Results Reported To: ______ Via: ______ Date: ___ / ___ / ___ Time: ______ Initials: ______
4. Comments: ______

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Appendix C

Photographs

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Building exterior, southwest entrance


Rm. 103, drill hall from north bay door


Rm. 122, water damaged/moldy ceiling above stairs


Rooftop AHU, south side of roof, fan side


Hallway outside of Rm. 109, water stained ceiling tiles


Rooftop AHU, south side of roof, filter side

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Boiler Room


Exterior POL storage

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<u>Appendix D</u>

References

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1. Department of Defense Instruction (0001) 6055.1, Department of Defense Occupational Safety and Health (OS H) Program, August 19, 1998.

2. Army Regulation (AR) 11-34, The Army Respiratory Protection Program, February 15, 1990.

3. DA PAM 40-503, Medical Service, Industrial Hygiene Program, October 30, 2000.

4. Technical Manual (T.M) 5-810-1, Mechanical Design, Heating, Ventilation, and Air Conditioning, June 1991.

5. Threshold Limit Values (TLVs) and Biological Exposure Indices (BEls), American Conference of Governmental Industrial Hygienists (ACGIH), current edition.

6. Industrial Ventilation - A Manual of Recommended Practices, American Conference of Governmental Industrial Hygienists (ACGIH), current edition.

7. UFC 3-410-01 FA Heating, Ventilating, and Air Conditioning, 15 May 2003

8. Occupational Safety and Health Administration (OSHA) Lead in Construction Standard, 29 CFR 1926.62

9. OSHA Lead Standard 29 CFR 1910.1025

10. OSHA Respiratory Protection Standard 29 CFR 1910.134

11. Army Regulation (AR) 385-10, The Army Safety Program, August 23, 2007.

12. RP-1-2004, Office Lighting, Illuminating Engineering Society of North America (IESNA)/ANSI.

13. RP-7-2001, Industrial Lighting, (IESNA)/ANSI.

14. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Standard 62.1-2007, "Ventilation for Acceptable Indoor Air Quality".

15. ASHRAE Standard 55-2004 – "Thermal Environmental Conditions for Human Occupancy"

16. Title 24, CFR, Part 35, Subpart B, Sections 35.110, Definitions of Lead-Based Paint, Housing and Urban Development, U.S. Department of Housing.

17. OSHA Personal Protective Equipment 29 CFR 1910.132

18. OSHA Permissible Exposure Limit (PEL) for General Industry 29 CFR 1910.1000 Z-1 Table

19. Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Department of Health and Mental Hygiene, November 2008.

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20. Mold Remediation in Schools and Commercial Buildings, U.S. Environmental Protection Agency, March 2001

21. Army Facilities Management Information Document on Mold Remediation Issues TG277, February 2002

22. OSHA Welding, Cutting, Brazing 29 CFR 1910.252

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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. [redacted]) Army National Guard Bureau, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, MG 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. [redacted], at commercial (410) 436-5475/3118, DSN 584-5475/3118, or electronic mail: [redacted]@us.army.mil

FOR THE COMMANDER:

[redacted]

Encl

Director, Occupational Health Sciences

Readiness thru Health

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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

Approved for public release; distribution unlimited.

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US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

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. Lead Exposure. 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. Asbestos. 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. Heating, Ventilation, and Air Conditioning Systems. The heating and cooling systems were not operating in some rooms in the building.

d. Other Building Concerns. The point of contact stated that the drinking water had a bad taste.

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3. RECOMMENDATIONS.

a. Lead Exposure. 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. Other Building Concerns. 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.

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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. [redacted], 28 February 2003, subject: SAB.

4. BACKGROUND INFORMATION.

a. Armory Mission and Background Information. 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. Armory Use by Children. 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. POC. The POC was Mr. [redacted] Armory Manager, 10901 Notchcliff Road, Glen Arm, MD 21057-9998, Phone. 410-592-2535.

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5. FACILITY EVALUATION.

a. Sampling. 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 asbestos-containing 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. Heating, Ventilation, and Air Conditioning Systems. The building was heated with central heat and air conditioning. The heating 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. Noise Dosimetry. 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. Lead in Air. The Army complies with the Occupational Safety and Health Administration (OSHA) 8-hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter ($\mu g/m^3$) of air.

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b. Lead in Dust. The Environmental Protection Agency (EPA) and State of Maryland limits for lead in dust are 40 micrograms per square foot (μg/ft^2) on floors, 250 μg/ft^2 on window sills, and 400 μg/ft^2 in window troughs. These limits apply to pre-1978 Army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The 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 μg/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. Lead Carcinogenicity. The Department of Health and Human Services National Toxicology Program (NTP) released the Report on Carcinogens, Eleventh Edition in February 2005. The NTP report lists "lead and lead compounds" as "reasonably anticipated to be human carcinogens."

7. SAMPLING RESULTS, DISCUSSION, AND CONCLUSIONS.

a. Lead in Dust. Lead in dust sample locations and analytical results are shown in the Table. Sample results greater than 40 μg/ft^2 for floors or 200 μg/ft^2 for other surfaces are highlighted.

TABLE. Lead in Surface Dust Locations and Analytical Results.

Wipe Sample Number	Location of Samples	Result (μg/ft^2)
GAW01	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

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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 $\mu g/ft^2$ on floors and 250 $\mu g/ft^2$ 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. Lead in Air. 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 $\mu g/m^3$, and were below the laboratory analytical reporting limit for lead in air of 1 µg/sample, as well as the OSHA standard of 50 $\mu g/m^3$ for lead in air over an 8 hour day.

c. Lead in Paint. 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. Asbestos. 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. Lead Exposure. Health Hazard RAC 3. Clean horizontal surfaces in the administrative areas to the NGB Region North and 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 EPA lead in dust standards for young children, and clean other horizontal surfaces in the Drill Hall and Classroom to the NGB

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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. Heating, Ventilation, and Air Conditioning Systems. 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. Other Building Concerns. 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.

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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: [redacted]@us.army.mil

[redacted]

Industrial Hygienist
USACHPPM Lead and Asbestos Team Leader
Industrial Hygiene Field Services Program

APPROVED:

[redacted]

Technical Program Manager
Industrial Hygiene Field Services Program

APPENDIX A

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

8. U.S. Department of Housing and Urban Development (HUD), Technical Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing 1998.
http://www.hud.gov/offices/lead/guidelines/hudguidelines/index.cfm

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APPENDIX B

SAMPLING SHEETS AND LAB ANALYSES

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Glen Arm - Lead Dust Wipe Samples

			Indoor Range Info					
Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (μg/ft²)
			No			Yes		
GAW01	Glen Arm	Glen Arm					Locker room (Converted FR) floor where former bullet trap	25
GAW02	Glen Arm	Glen Arm					Desk top in converted IFR	56
GAW03	Glen Arm	Glen Arm					Food prep area in kitchen	BDL
GAW04	Glen Arm	Glen Arm					Work out room on wall near exterior exit	BDL
GAW05	Glen Arm	Glen Arm					Window sill in room 125 A	568
GAW06	Glen Arm	Glen Arm					Locker room off men's room . Room 124 on Floor	BDL
GAW07	Glen Arm	Glen Arm					Room 108 (storage) supply room floor	97

Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211
(303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

August 15, 2003

Laboratory Code: **RES**
Subcontract Number: **NA**
Laboratory Report: **RES 96187-1**
Project Description: **None Given**
None Given

[redacted]
USACHPPM
USACHPM, ATTN: MCHB-TS-OFS Bldg 1570
APG MD 21010

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association, Lab ID 101533 - Accreditation Certificate #480. The laboratory is currently proficient in both PAT & ELPAT programs respectively.

Reservoirs has analyzed the following sample(s) using Atomic Emission Spectroscopy - Inductively Coupled Plasma (AES-ICP) per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the analysis table. Results have been sent to your office.

RES 96187-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you should have any questions about this report, please feel free to call me at 303-964-1986.

Sincerely,

[redacted]
President

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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**
Client Project Description:	**None Given**
Date Samples Received:	**August 4, 2003**
Analysis Type:	**USEPA SW846 3050B / AA(7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 11, 2003**

Client ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
CF BLANK01	EM 802204	0.11	BDL	23	BDL
CF W01	EM 802205	0.11	BDL	23	BDL
CF W02	EM 802206	0.11	BDL	23	BDL
CF W03	EM 802207	0.11	BDL	23	BDL
CF W04	EM 802208	0.11	BDL	23	BDL
CF W05	EM 802209	0.11	8.0	23	73
CF BLANK02	EM 802210	0.11	BDL	23	BDL
CF W06	EM 802211	0.11	46.3	23	421
CF W07	EM 802212	0.11	BDL	23	BDL
WR BLANK01	EM 802213	0.11	BDL	23	BDL
WR W01	EM 802214	0.11	BDL	23	BDL
WR W02	EM 802215	0.11	BDL	23	BDL
WR W03	EM 802216	0.11	150.0	23	1364
WR W04	EM 802217	0.11	14.5	23	132
WR W05	EM 802218	0.11	BDL	23	BDL
WR BLANK02	EM 802219	0.11	BDL	23	BDL
WR W06	EM 802220	0.11	BDL	23	BDL
WR W07	EM 802221	0.11		No Sample Submitted In Tube	
EC BLANK01	EM 802222	0.11	BDL	23	BDL
EC W01	EM 802223	0.11	BDL	23	BDL
EC W02	EM 802224	0.11	BDL	23	BDL
EC W03	EM 802225	0.11	2.5	23	23
EC W04	EM 802226	0.11	BDL	23	BDL
EC W05	EM 802227	0.11	BDL	23	BDL
EC BLANK02	EM 802228	0.11	BDL	23	BDL
EC W06	EM 802229	0.11	BDL	23	BDL
EC W07	EM 802230	0.11	BDL	23	BDL
EC W08	EM 802231	0.11	BDL	23	BDL
GA BLANK01	EM 802232	0.11	BDL	23	BDL
GA W01	EM 802233	0.11	2.7	23	25

BDL = Below Detection Limit

Data Qa

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**
Client Project Description:	**None Given**
Date Samples Received:	**August 4, 2003**
Analysis Type:	**USEPA SW846 3050B / AA(7420)**
Turnaround:	**3-5 Day**
Date Samples Analyzed:	**August 11, 2003**

Client ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
GA W02	EM 802234	0.11	6.2	23	56
GA W03	EM 802235	0.11	BDL	23	BDL
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	BDL	23	BDL
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**

BDL Below Detection Limit

Data Ca

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NVLAP Accredited Laboratory #101896
AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: 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, 2003

Client ID Number	Lab ID Number	Detection Limit (%)	LEAD CONCENTRATION (%)
CF BULK 01	EM 802169	0.005	BDL
CF BULK 02	EM 802170	0.005	0.053
CF BULK 03	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 BULK 01	EM 802179	0.005	0.012

BDL -- Below Detection Limit

Data Qa

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DATA CHEM LABORATORIES, INC.

TEST REPORT
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8/11/03

Submitted To: Non-Responsive [redacted]
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-S-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.

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Non-Responsive [redacted]
Analyst

Non-Responsive [redacted]
Reviewer

CINCINNATI OFFICE
4388 GLENDALE-MILFORD ROAD
CINCINNATI, OHIO 45242-3706
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WEST COAST OFFICE
11 SANTA YORMA COURT
NOVATO, CALIFORNIA 94945
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Results
Lead

Client #	DCL #	Sample Volume (L)	µg/sample	mg/m^3
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.

[redacted]
Analyst

[redacted]
Reviewer

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(e) (8) (viii)) and State of Maryland standards are not directly applicable because they are developed for floors (40 $\mu g/ft^2$), windowsills (250 $\mu g/ft^2$)and window troughs (400 $\mu g/ft^2$) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. OSHA has no specific requirement for work area surfaces. The OSHA lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. OSHA cites a level of 200 $\mu g/ft^2$ in OSHA Instruction CPL 2-2.58 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 $\mu g/ft^2$ is a safe surface contamination level for adult exposures. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels higher than those recommended above do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All States will receive this guidance when it is completed.

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 50 $\mu g/m^3$ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

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APPENDIX D

LEAD CLEANING GUIDANCE

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Chapter 14:

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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.

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— Step-by-Step Summary (continued) -

16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.

17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.

18. Cleaning equipment list:

- HEPA vacuums.
- Detergent.
- Waterproof gloves.
- Rags.
- Sponges.
- Mops.
- Buckets.
- HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
- 6-mil plastic bags.
- Debris containers.
- Waste water containers.
- Shovels.
- Rakes.
- Water-misting sprayers.
- 6-mil polyethylene sheeting (or equivalent).

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Chapter 14:

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris and dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove all leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?
- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

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C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below

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Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards and were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

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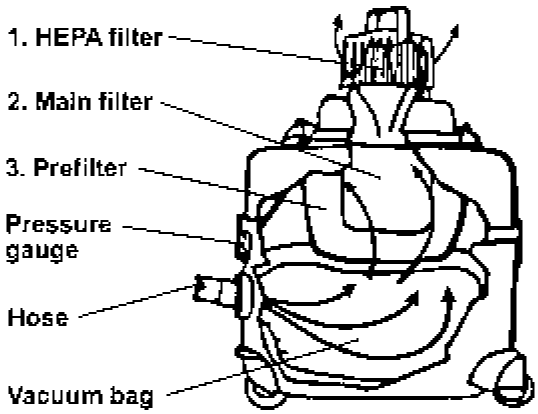
Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and prefilter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the prefilter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

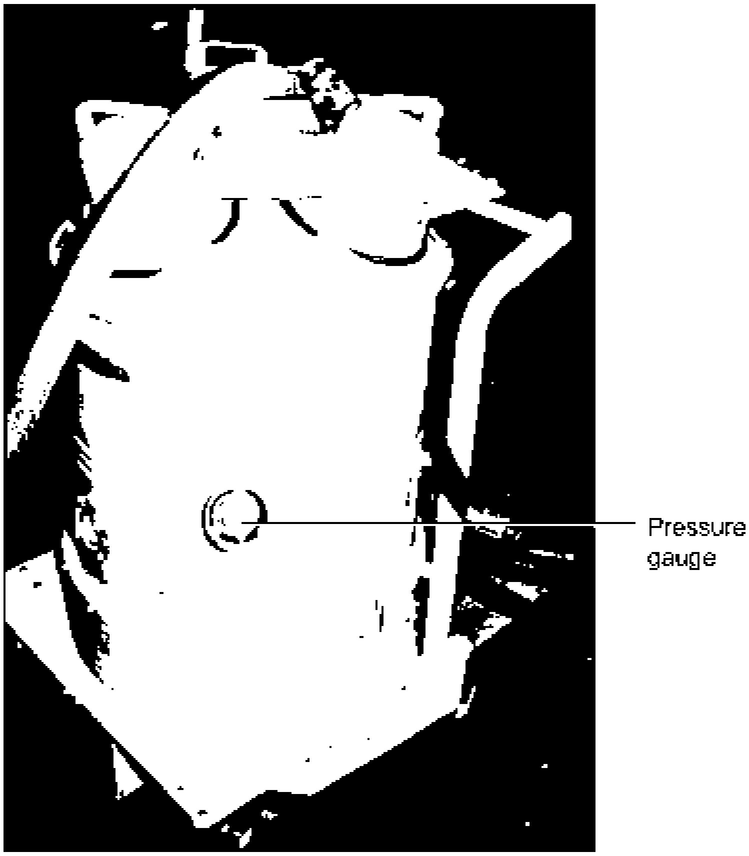


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

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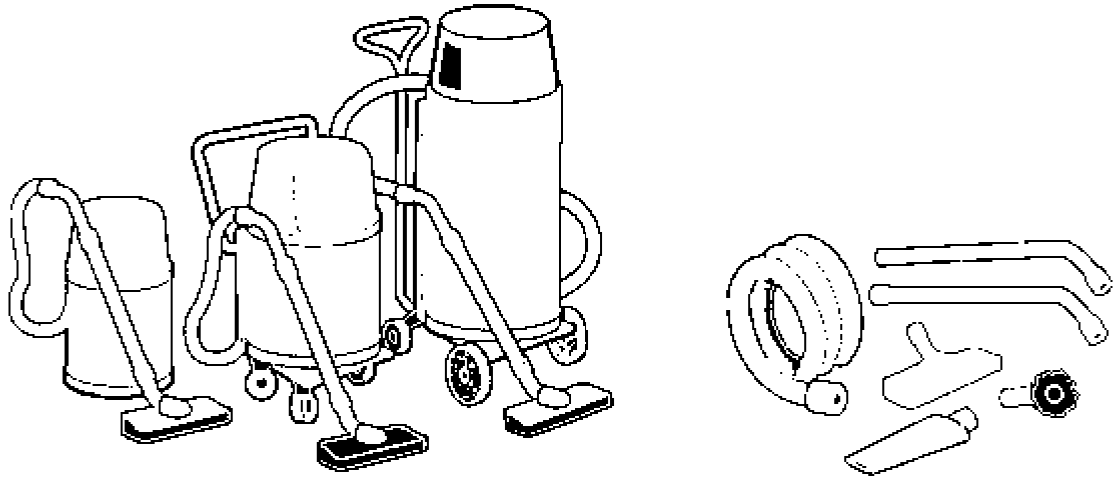
Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

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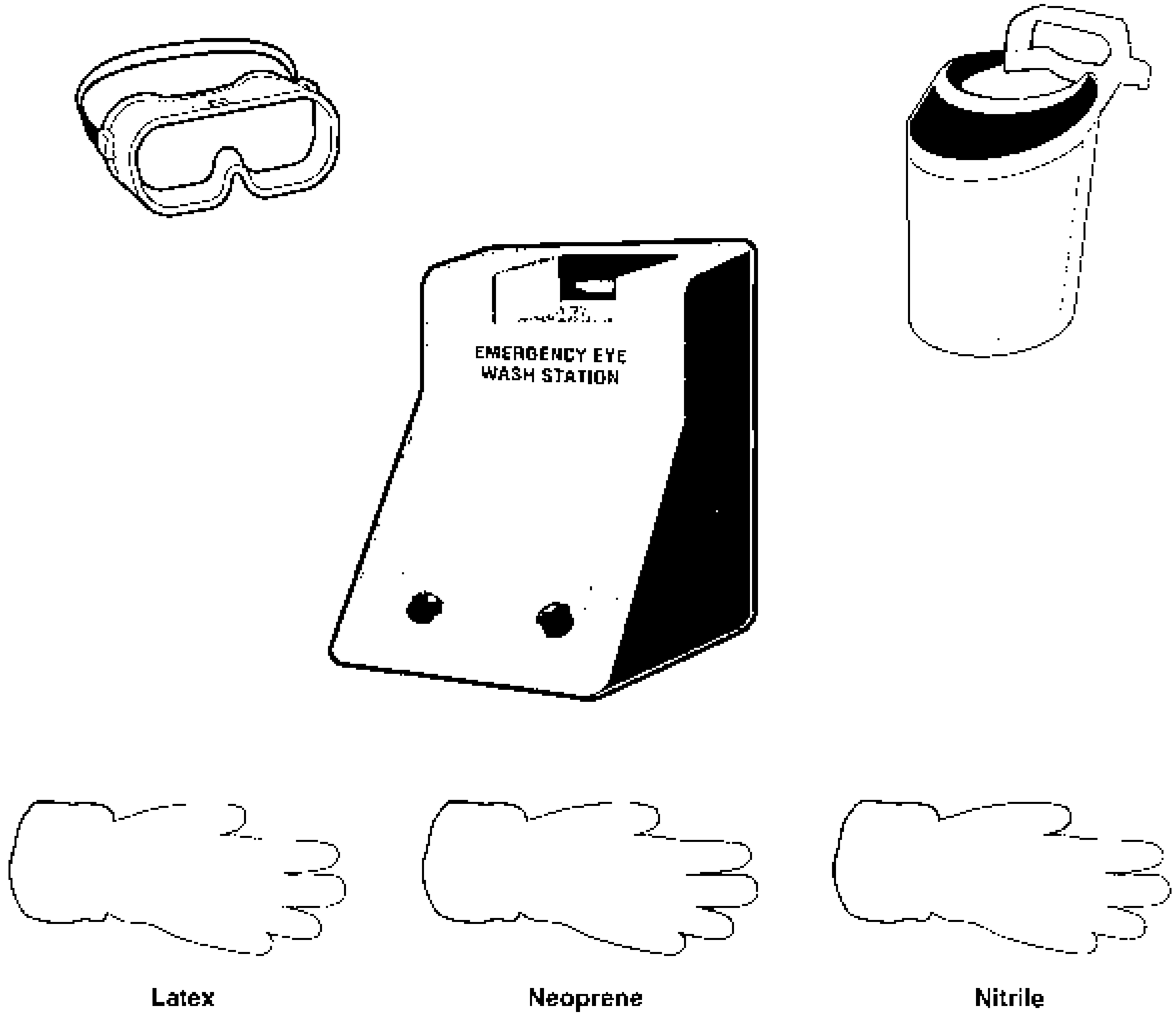
Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

- First, the area is HEPA vacuumed.

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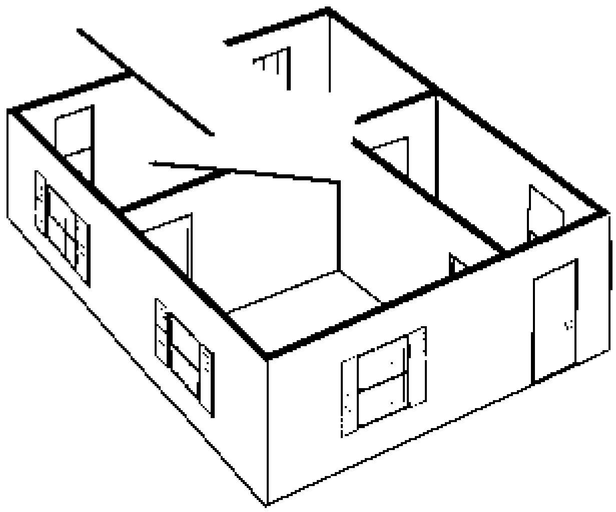
Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on, and work down to the floor. Do every inch of the windows, especially the window troughs.

Courtesy: Alice Hamilton Occupational Health Center

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- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.

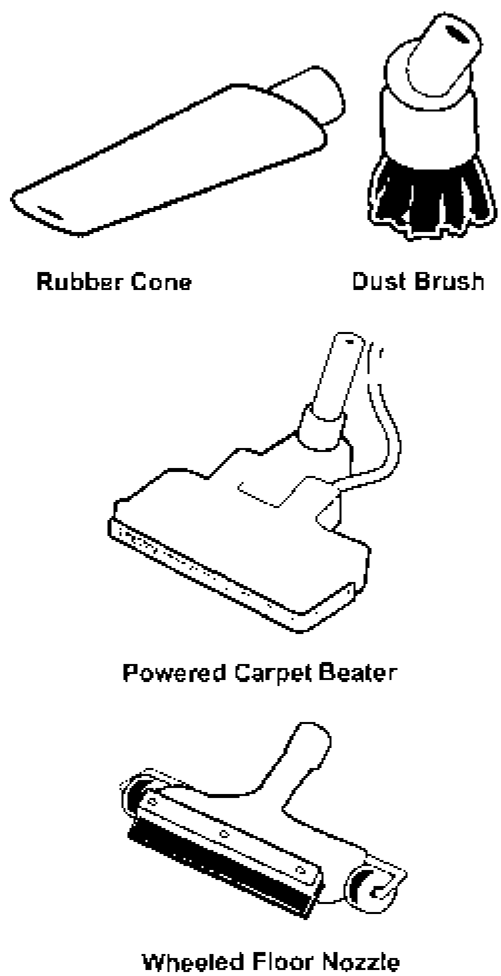

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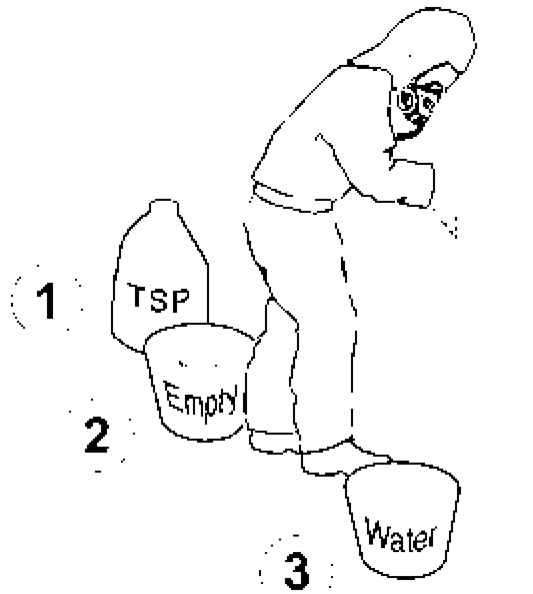
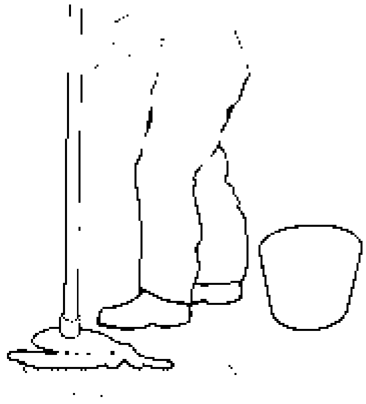
Figure 14.4c (continued)

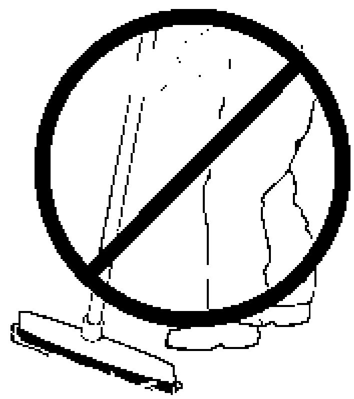
Wash all surfaces with suitable detergents
Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.



Wipe All Surfaces



Wet Mop Floor



Don't Dry Sweep

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May, 2018

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APPENDIX E

PHOTOGRAPHS

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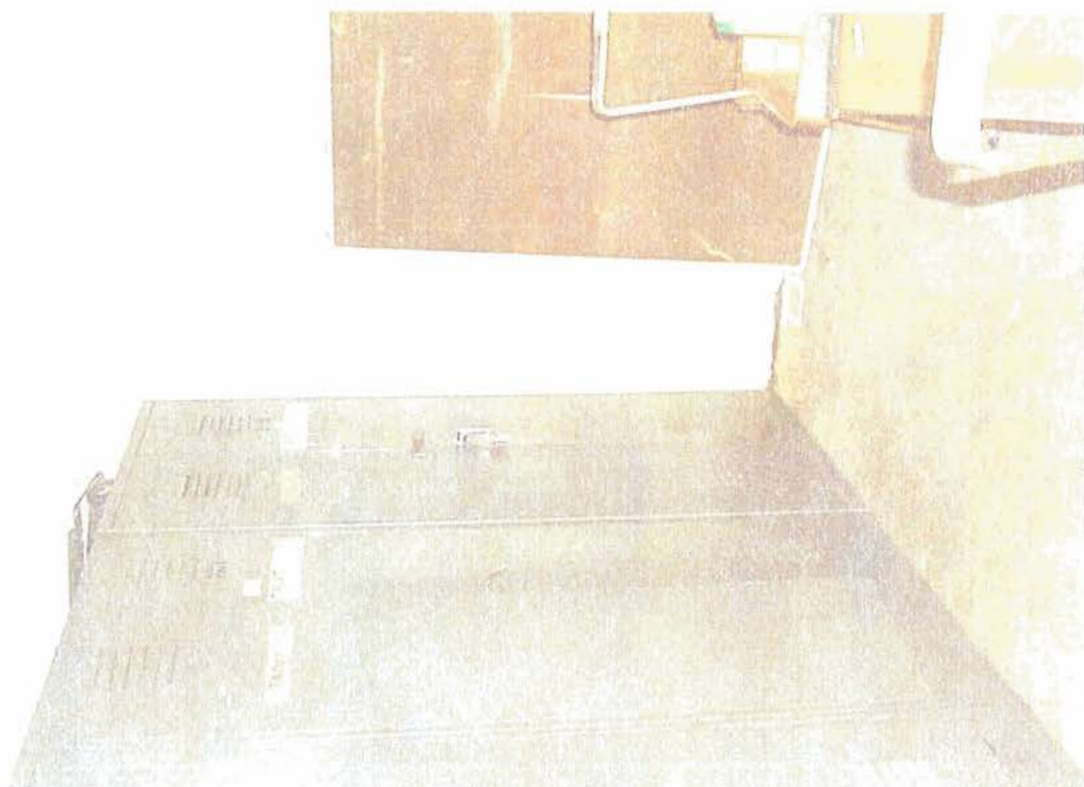

1431

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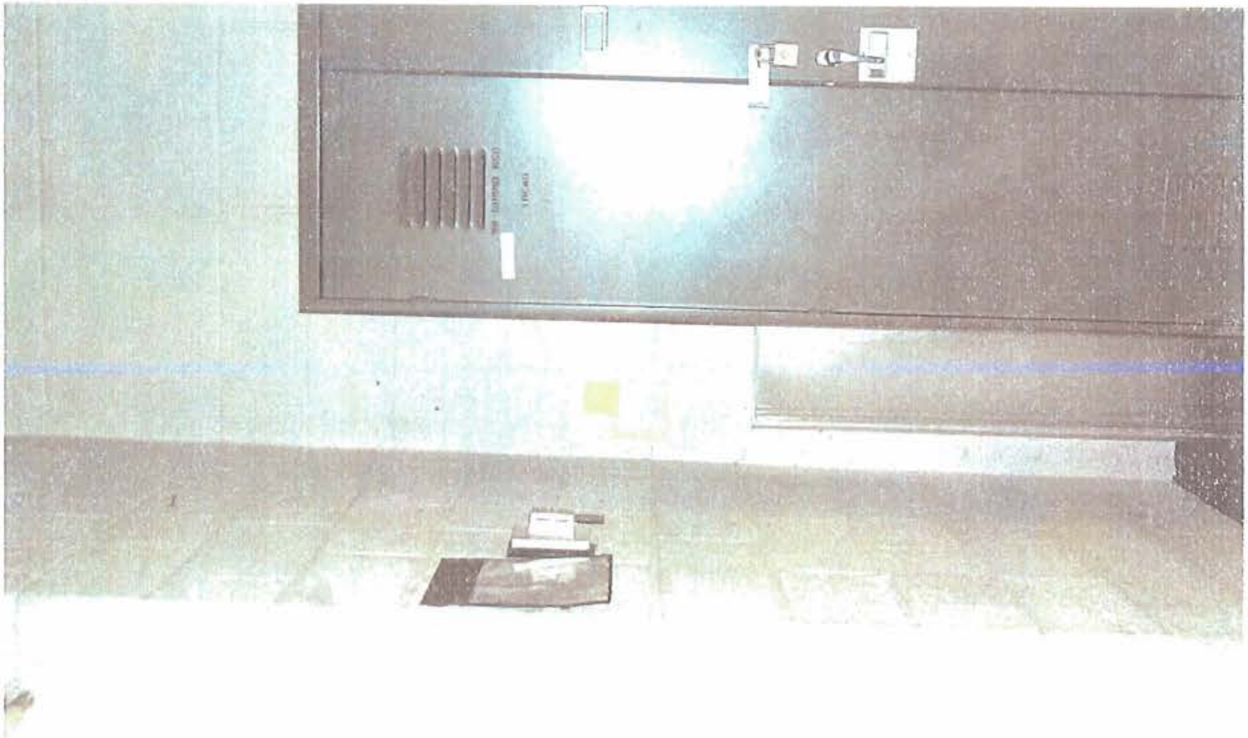
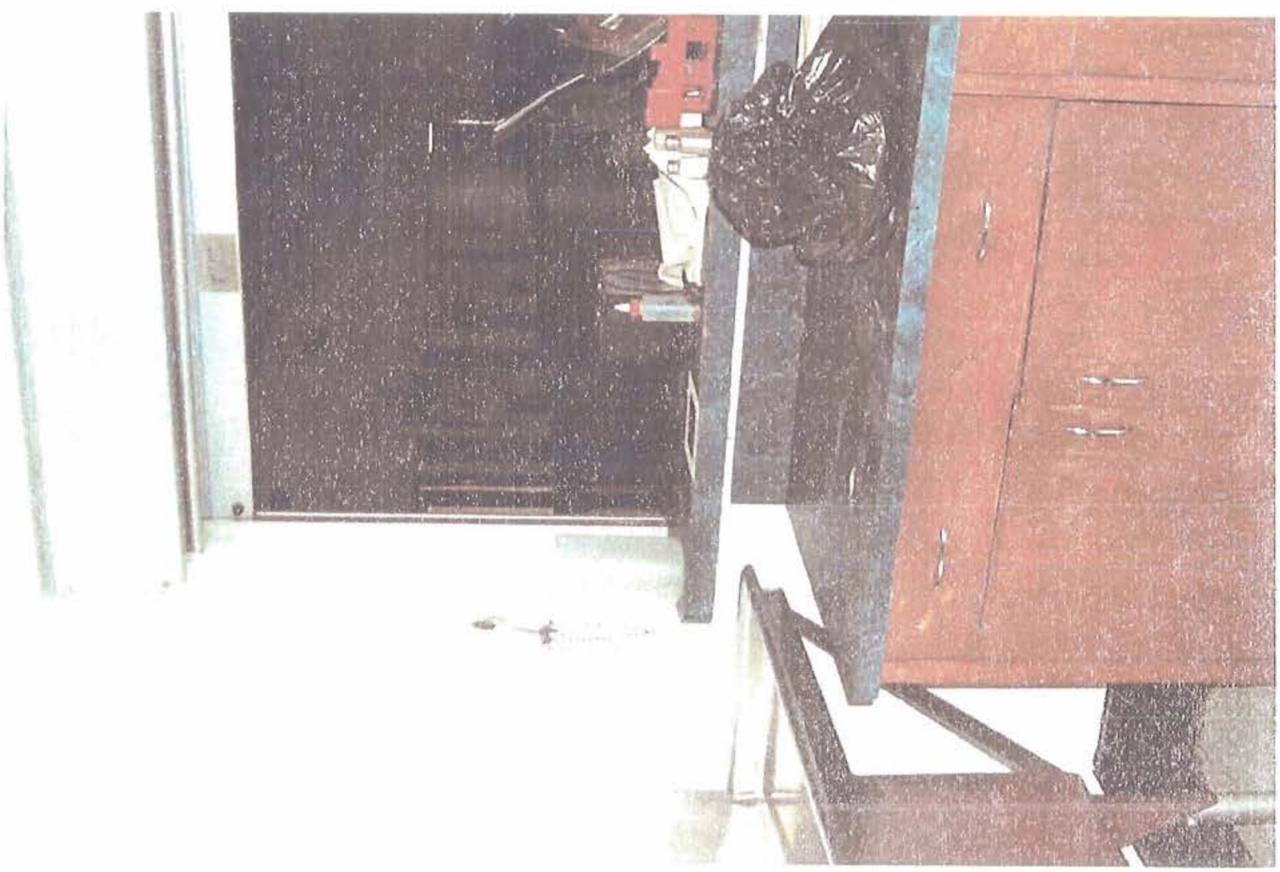


1434



1433

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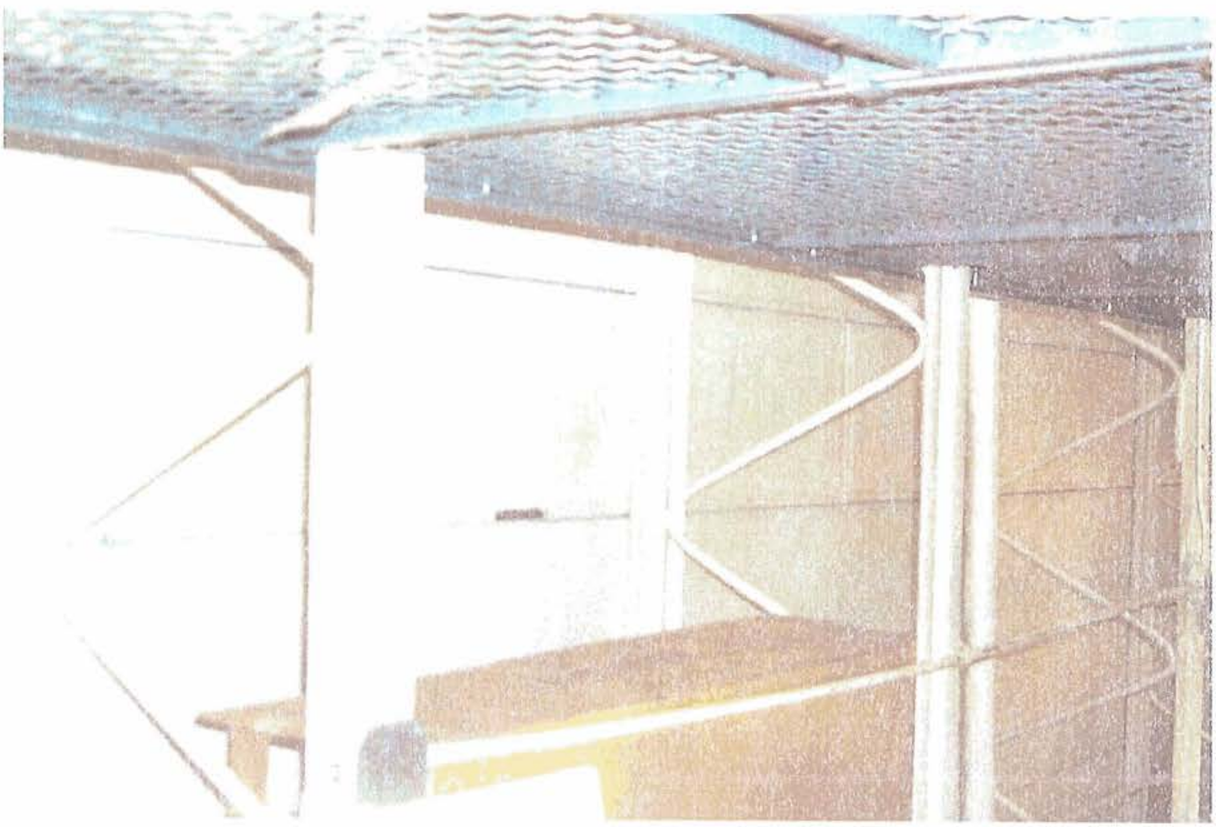

1437

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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:

The EI Group, Inc.
2101 Gateway Centre Blvd.
Morrisville, North Carolina
27560

Report Date: December 30, 2008

Project ID: IHMO080101.03

Non-Responsive [redacted]
Manager, Charlotte Operations

Non-Responsive [redacted]
Senior Industrial Hygienist

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List of Appendices

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. [redacted], CIH.

Employees were not performing tasks that provided excessive noise levels, as such; noise exposure monitoring was not conducted.

Lighting within the facility was also evaluated. Lighting was found to be within applicable recommended levels.

Various surfaces within the HVAC system and throughout the facility were screened for lead. The screening was completed using surface/wipe and air samples. None of the air samples collected were found to have detectable levels of the respective lead contaminant, and 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.

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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 Wipe^{TM} samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 µm MCE cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, MD for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix B.

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Lead Testing Results Summary

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/ft^2 as a benchmark for identifying contaminated surfaces. In the" Derivation of Wipe Surface Screening Levels for Environmental Chemicals", the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, HUD levels of 40 $\mu g/ft^2$ on floors and 250 $\mu g/ft^2$ on windowsills should be observed.

No detectable levels of lead were identified in those air samples collected. Currently, OSHA observed an 8-hour time weighted average of 50 ug/m^3.

Lighting

A lighting assessment was conducted throughout the facility. The survey was conducted with large bay doors closed. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. 98047EL). The light meter was last calibrated on February 22, 2008. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

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

Lighting within the facility was found to be sufficient.

<u>Indoor Air Quality</u>

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°F to 79.7°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.

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
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**

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/m^3 to 468 spores/m^3. The concentration observed outdoors was found to be 11,300 spores/m^3. 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 EI Group, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

References

Title 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration.

Lead - (29 CFR 1910.1025(h))

American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2008 Edition

Industrial Ventilation: A Manual of Recommended Practice for Design, 25th Edition

Georgia Army National Guard: Standard Army Safety and Occupational Health Inspection Checklist; 1 October 1999 Edition

ANSI Z358.1 – 2004, Emergency Eye Wash and Shower Equipment

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007.

RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

National Emission Standard Hazardous Air Pollutants (NESHAP) - The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

Environmental Protection Agency (EPA) standards (40 Code of Federal Regulations (CFR) 745.227(h)(3))

Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation

Appendix A

Photographs

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Exterior view of facility

Room 105: Water damaged ceiling panels

Hallway (102): Water damaged ceiling panels

Water damaged ceiling tiles: Room 127

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View of old firing range. Converted to locker room

Exterior view of facility

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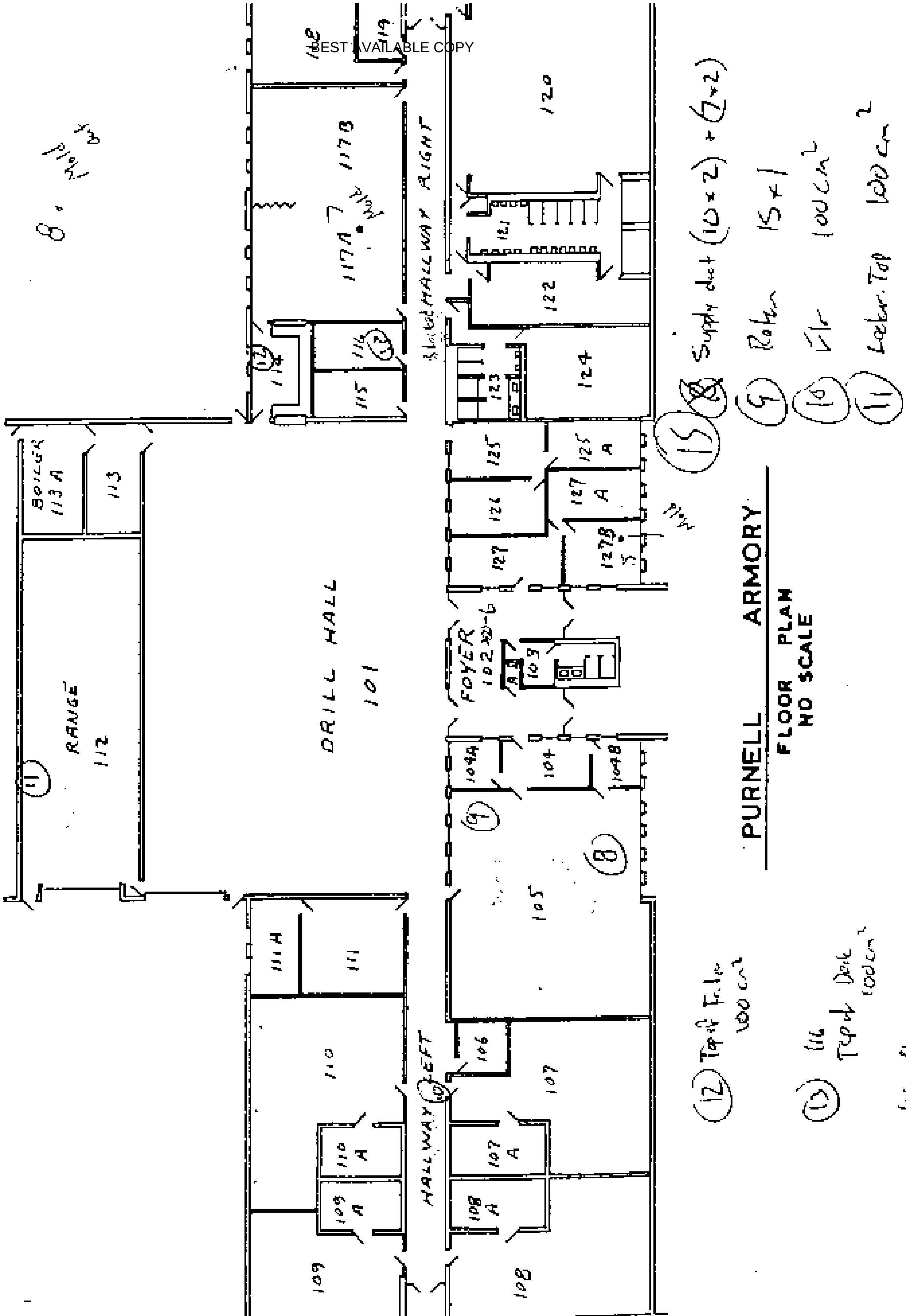

Appendix B
Analytical Reports

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AMA Analytical Services, Inc.

Invoice: **95230**

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	**Job Location:**	Not Provided	**Date Submitted:**	10/1/2008
	State Military Reservation	**Job Number:**	Not Provided	**Date Analyzed:**	10/8/2008
	Havre de Grace, Maryland	**P.O. Number:**	Not Provided	**Date Invoiced:**	10/8/2008
	21078			**Person Submitting:**	[redacted]

Attention: [redacted]

Page 1 of 1

AMA Sample #	Client Sample #	Analysis and Sample Type	Turn Around	Cost	Additional Analysis and Sample Type *	Turn Around *	Additional Cost *	Total Cost
0881923	500-1	AA Lead Air	5 Day +	$8.00				$8.00
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.

Note: All Accounts over 30 days are subject to a 1½% per month service charge.

* Only apply if additional analysis was performed on the sample(s)

Account Code: NATLG

Remit to: P.O. Box 646, Hanover, Maryland 21076, 410-684-3327

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCREDITED LABORATORY AIHA Environmental Lead See aihaiqap.org for details

100470

NY ELAP

10920

Client:	National Guard Bureau	**Job Name:**	RC 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:**	[redacted]
		P.O. Number:	Not Provided	**Date Analyzed:**	9/8/2008 **Report Date:** 9/8/2008

Attention: [redacted]

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Final Result	Comments
0881923	500-1	Flame	Air	1068	N/A	2.81 ug/m³	< 2.8 ug/m³	
0881924	500-2	Flame	Air	1005	N/A	2.99 ug/m³	< 3 ug/m³	
0881925	500-3	Flame	Air Blank	0	N/A	3.00 ug/m³	< 3 ug	
0881931	9	Flame	Wipe	****	0.108	111.52 ug/ft²	170 ug/ft²	
0881932	10	Flame	Wipe	****	0.108	111.52 ug/ft²	< 110 ug/ft²	
0881933	11	Flame	Wipe	****	0.108	111.52 ug/ft²	< 110 ug/ft²	
0881934	12	Flame	Wipe	****	0.108	111.52 ug/ft²	170 ug/ft²	
0881935	13	Flame	Wipe	****	0.108	111.52 ug/ft²	< 110 ug/ft²	
0881936	14	Flame	Wipe Blank	****	N/A	12.00 ug	< 12 ug	
0881937	15	Flame	Wipe	****	0.037	327.87 ug/ft²	1600 ug/ft²	

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA Environmental Lead Accredited Laboratory — See aihalap.org for details — 100470

NY ELAP 10920

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:**	[redacted]		
		P.O. Number:	Not Provided	**Date Analyzed:**	9/8/2008	**Report Date:**	9/8/2008
Attention:	[redacted]						

Summary of Atomic Absorption Analysis for Lead

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AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)

%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

See QC Summary for analytical results of quality control samples associated with these sampes.

NY ELAP accrediation applies only to paint chip, wipe, and water samples.

Analyst: Melissa Sampson

Technical Manager: G Edward Carney

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This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and 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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AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 16543

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	9/8/2008

	Result		Percent Recovery	RPD	Comment
Preparation Blank	-0.113	ppm			Acceptable
Report Limit Verification Sample	0.2343	ppm	70.3%		Outside Limits
Expected Spike Level (ppm) 0.3333					
Duplicate Sample 1	#Num!	mg/Kg			
Duplicate Sample 2	#Num!	mg/Kg		#Error	#Error
Matrix Spike Analysis					
Spiked Sample			99.69%		Acceptable
Spike Duplicate					Acceptable
Laboratory Control Sample 1	330.278	µg	102.38%		Acceptable
Laboratory Control Sample 2	294.439	µg	100.89%	1.47%	Acceptable

Calibration Information

Correlation of Calibration Curve 0.999768

All calibration verification samples are within acceptance limits.

Notes: Recovery for the Report Limit Verification Sample was 70.3%, below the lower control limit of 80%. A passing Report Limit Verification sample for wipe samples for this analysis date can be found with SDG 16546 (119.62% recovery).

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181396	81888	L1
181396	81889	L1A

SDG Number: 16543

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FOIA Requested Record #J-15-0085 (MD)
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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181396	81890	L2
181396	81891	L3
181396	81892	L4
181396	81893	L5
181396	81894	L6
181396	81895	L7
181396	81896	L8
181396	81897	L9
181396	81898	L10
181399	81931	9
181399	81932	10
181399	81933	11
181399	81934	12
181399	81935	13
181399	81936	14
181399	81937	15

SDG Number: 16543

AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 16542

Analysis Type:	Flame
Sample Type:	Air
Analysis Date:	9/8/2008

		Result		Percent Recovery	RPD	Comment
Preparation Blank		0.010	ppm			Acceptable
Report Limit Verification Sample		0.2686	ppm	107.4%		Acceptable
Expected Spike Level (ppm)	0.25					
Duplicate Sample 1		#Num!	mg/Kg			
Duplicate Sample 2		#Num!	mg/Kg		#Error	#Error
Matrix Spike Analysis						
Spiked Sample				102.73%		Acceptable
Spike Duplicate				99.56%	3.14%	Acceptable
Laboratory Control Sample 1		133.956	µg	103.29%		Acceptable
Laboratory Control Sample 2		120.145	µg	100.16%	3.07%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999875

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
182853	81732	84081
182853	81734	84083

SDG Number: 16542

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Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
182853	81738	84087
182853	81739	84088
503162	81781	OLN-LA-01
503162	81782	OLN-LA-FB1
503158	81797	HLN-LA-01
503158	81798	HLN-LA-FB1
503165	81852	JTN-LA-01
503165	81853	JTN-LA-FB1
181396	81872	1
181396	81873	2
181396	81874	3
181398	81913	516-1
181398	81914	516-2
181398	81915	516-3
181399	81923	500-1
181399	81924	500-2
181399	81925	500-3

SDG Number: 16542

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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:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	Not Provided	**Date Analyzed:**	9/8/2008
				Report Date:	

AMA Sample #	0881926
Client ID	500-4
Analyst ID	RC
Collection Apparatus	Allergenco
Sample Volume (L)	150
Analytical Sensitivity (sp/m³)	28
Sample Condition	Acceptable

	Raw CT.	%	sp/m³
Alternaria			
Ascospores	1	5.9%	28
Aureobasidium			
Basidiospores	9	52.9%	248
Bipolaris/Drechslera/Helm.			
Boletus			
Botrytis			
Cercospora			
Chaetomium			
Cladosporium	2	11.8%	55
Coprinus			
Curvularia			
Epicoccum			
Fusarium			
Ganoderma			
Nigrospora			
Penicillium / Aspergillus	3	17.6%	83
Pithomyces			
Rusts			
Smuts/Periconia/Myxomycetes			
Stachybotrys			
Stemphylium			
Trichoderma			
Torula			
Ulocladium			
Zygomycetes			
Other Colorless	2	11.8%	55
Unknown			
Hyphal Fragments*			
Totals Spore Concentration			468
Location			
Comments			

AMA Sample #	0881927
Client ID	500-5
Analyst ID	RC
Collection Apparatus	Allergenco
Sample Volume (L)	150
Analytical Sensitivity (sp/m³)	28
Sample Condition	Acceptable

	Raw CT.	%	sp/m³
Alternaria			
Ascospores	3	3.4%	83
Aureobasidium			
Basidiospores	47	52.8%	1,290
Bipolaris/Drechslera/Helm.			
Boletus			
Botrytis			
Cercospora			
Chaetomium			
Cladosporium	10	11.2%	275
Coprinus			
Curvularia			
Epicoccum			
Fusarium			
Ganoderma			
Nigrospora			
Penicillium / Aspergillus	9	10.1%	248
Pithomyces	1	1.1%	28
Rusts			
Smuts/Periconia/Myxomycetes			
Stachybotrys			
Stemphylium			
Trichoderma			
Torula			
Ulocladium			
Zygomycetes			
Other Colorless	19	21.3%	523
Unknown			
Hyphal Fragments*			
Totals Spore Concentration			2,450
Location			
Comments			

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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:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	Not Provided	**Date Analyzed:**	9/8/2008
				Report Date:	

AMA Sample #	0881928			**AMA Sample #**	0881929		
Client ID	500-6			**Client ID**	500-7		
Analyst ID	RC			**Analyst ID**	RC		
Collection Apparatus	Allergenco			**Collection Apparatus**	Allergenco		
Sample Volume (L)	150			**Sample Volume (L)**	150		
Analytical Sensitivity (sp/m³)	28			**Analytical Sensitivity (sp/m³)**	28		
Sample Condition	Acceptable			**Sample Condition**	Acceptable		

	Raw CT.	%	sp/m³		Raw CT.	%	sp/m³
Alternaria	Present		< 28	**Alternaria**			
Ascospores	Present		< 28	**Ascospores**			
Aureobasidium				**Aureobasidium**			
Basidiospores	5	33.3%	138	**Basidiospores**			
Bipolaris/Drechslera/Helm.				**Bipolaris/Drechslera/Helm.**			
Boletus				**Boletus**			
Botrytis				**Botrytis**			
Cercospora				**Cercospora**			
Chaetomium				**Chaetomium**			
Cladosporium	2	13.3%	55	**Cladosporium**			
Coprinus				**Coprinus**			
Curvularia				**Curvularia**			
Epicoccum				**Epicoccum**			
Fusarium				**Fusarium**			
Ganoderma				**Ganoderma**			
Nigrospora				**Nigrospora**			
Penicillium / Aspergillus	3	20.0%	83	**Penicillium / Aspergillus**			
Pithomyces	Present		< 28	**Pithomyces**			
Rusts				**Rusts**			
Smuts/Periconia/Myxomycetes				**Smuts/Periconia/Myxomycetes**			
Stachybotrys				**Stachybotrys**			
Stemphylium				**Stemphylium**			
Trichoderma				**Trichoderma**			
Torula				**Torula**			
Ulocladium				**Ulocladium**			
Zygomycetes				**Zygomycetes**			
Other Colorless	4	26.7%	110	**Other Colorless**			
Unknown	1	6.7%	28	**Unknown**			
Hyphal Fragments*	7		193	**Hyphal Fragments***			
Totals Spore Concentration			413	**Totals Spore Concentration**			< 28
Location				**Location**			
Comments				**Comments**	No Visble Trace. No Mold Spores Detected.		

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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:**	[redacted]
Attention:	[redacted]	**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
Analytical Sensitivity (sp/m³)	41
Sample Condition	Acceptable

	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				
Nigrospora				
Penicillium / Aspergillus	8	2.9%		330
Pithomyces	Present		<	41
Rusts				
Smuts/Periconia/Myxomycetes	1	0.4%		41
Stachybotrys				
Stemphylium				
Trichoderma				
Torula				
Ulocladium				
Zygomycetes				
Other Colorless	17	6.2%		702
Unknown				
Hyphal Fragments*	1			41
Totals Spore Concentration				11,300
Location				
Comments				

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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:**	[redacted]
Attention:	[redacted]	**P.O. Number:**	Not Provided	**Date Analyzed:**	9/8/2008
				Report Date:	

General Comments, Disclaimers, and Footnotes

Analytical Method: Sample are analyzed following the instructions and guidelines outlined in AMA Analytical Services, Inc. SOP 901.

Sample Condition: Acceptable: The sample was collected and delivered to the our location without disturbing the material on the sampling media.

Unacceptable: 1. The sample is overloaded with material. 2. The sample trace has been disturbed. 3. The sample was not collected properly.

Obscured: The loading on the sample is high, possibly obscuring spores present. The quantity reported should be considered the minimum concentration present. The actual concentration may be higher than the reported concentration.

Spore Notes: Based on their small size and very few distinguishing characteristics, Aspergillus and Penicillium cannot be differentiated by non-viable sampling methods. There are other types of spores whose morphology is similar to Aspergillus and Penicillium and cannot be differentiated by non-viable sampling methods. Examples of these similar spores are Acremonium, Paecilomyces, Wallemia, and Trichoderma.

Smut, Periconia and Myxomycetes are three different types of organisms that have similar morphological characteristics.

Bipolaris/Dreschlera/Helm: Bipolaris / Dreschlera / Helminthosporium group.

Other Colorless represents all colorless spores that are non-distinctive and unidentifiable.

* Hyphal Fragments: A portion of the mycelium that becomes separated from the remainder of the thallus (vegetative body), each of which has the capacity to grow and form new individuals. Results for hyphal fragments are in fragments/m^3 and are not incorporated in the total spore concentration.

Quantification: Analytical Sensitivity (A.S.): This is dependent on the volume of air collected and the amount of the trace that was analyzed.

The value of "Present" indicated in the Raw Count column represents the presence of this spore type during the preliminary exam at 400x. The Raw Count converts to a whole number if the spore type is encountered again during the 1,000x enumeration. The sp/m^3concentration will be reported as less than the analytical sensitivity if "Present" is reported in the Raw Count.

Due to rounding, totals may not equal 100%

sp/m^3: Spores per cubic meter.

Results are reported to 3 significant figures.

Analyst Rolenda Chuyate

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.

SAMPLE CHAIN OF CUSTODY

EI

DATE SHIPPED	# OF SAMPLES	SAMPLE MEDIA TYPE	PROJECT NAME
	15		181399

CONTACT	TELEPHONE NUMBER

SAMPLE # OR AREA	SAMPLE DATE	SAMPLE VOLUME	ANALYSIS REQUESTED
500-1		1068.24 L	Lead Air
500-2		1004.97 L	↓
500-3		6 L	↓
500-4		150 L	Fungal Spore
500-5		150 L	↓
500-6		150 L	↓
500-7		150 L	↓
500-8		150 L	↓
9 Return 106		100 cm²	Lead wipe
10 Floor 111		100 cm²	↓
11 Locker Top 112		100 cm²	↓
12 [illegible]		100 cm²	↓
13 [illegible]		100 cm²	↓
14 [illegible]		[illegible]	↓
15 Sample [illegible]		34 cm²	↓

Samples Relinquished By: [signature] Signature 9/25/[illegible] Date

Samples Received By: Signature Date

Samples Analyzed By: Signature Date

Glen Arm

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AMA Analytical Services, Inc.
Focused on Results
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquiries) 181399

Mailing/Billing Information:
1. Client Name: National Guard Bureau NE
2. Address 1: 301-1H Old Bay Lane
3. Address 2: Harve de Grace, MD 21078
4. Address 3:
5. Phone #: 336 455 2558 Fax #: 704 593 1650

Submittal Information:
1. Job Name: RC 500 Glen Arm, MD
2. Job Location:
3. Job #: [redacted] P.O. #:
4. Contact Person [redacted] 336 455 2558
5. Submitted by: Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ Immediate ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day + Date Due: 09/11/08 ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)	☐ Include Data Sheets with Report ☒ Email [redacted] @ eq.com ☐ Fax: ☐ Verbal:

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)

TEM Air – Please Indicate Filter Type:
PC MCE Porosity ____ in a 25mm 37mm
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)

PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)

TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area)Dust D6480-99 ____ (QTY)

TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Lead Analysis
☐ Paint Chip ____ (QTY)
☒ Dust Wipe (wipe type ____) 7 (QTY)
☒ Air 3 (QTY)
☐ Soil/Solid ____ (QTY)
☐ TCLP ____ (QTY)
☐ Drinking Water ____ (QTY)
☐ Waste Water ____ (QTY)
☐ Dust Wipe Furnace (wipe type ____) ____ (QTY)

Mold - Direct Microscopic Analysis
☐ Collection Apparatus for Spore Traps
☒ Spore Trap 5 (QTY) ☐ Bulk ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **MATRIX**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
	See Attached															

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 9/4/08 @ 800 Via: UPS By (Print): [illegible] Sign: [illegible]
2. Date/Time Analyzed: 9/8/08 @ ____ By (Print): Rolenda Clugate Sign: Rolenda Clugate
3. Results Reported To: Vince Maisto Via: Email Date: 9/8/08 Time: ____ Initials:
4. Comments:

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COMPLIANCE MANAGEMENT INTERNATIONAL

1215 Manor Drive, Suite 205
Mechanicsburg, PA 17055
Phone: 717.590.7031
Fax: 717.590.7936
www.complianceplace.com

Industrial Hygiene Survey Report

National Guard Facility
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** **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**

[redacted]

____

[redacted]
Senior Industrial Hygienist

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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 [redacted].

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.

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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.

Lead Testing Results Summary

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**

Table Notes:

1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **ug/ft^2** = micrograms per square foot
4. **ug/m^3** = micrograms per cubic meter
5. **ug =** micrograms

Sources:

1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges
2. OSHA 29CFR1910.1025 Lead Standard

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 "Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban

Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Lead surface and air samples were collected. The following is a summary of the sample results from this survey.

- Surface levels of lead were below the recommended guideline of 200 ug/ft^2 in all 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/m^3).

- No chipping or peeling paint was observed.

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Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98011EL). The light meter was last calibrated in November 2012. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Drill Hall	31.8	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

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.

IAQ Assessment Summary

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**

Table Notes:
1. **Bolded** results exceed listed criteria
2. **ppm =** parts per million
3. **(%) =** percent relative humidity
4. **°F =** 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.

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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.

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Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98011EL	11/2012	NA
SKC Air Sampling Pump	647598	5/31/13	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.

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Appendix A. Laboratory Analysis Report

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AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA-LAP, LLC ACCREDITED LABORATORY LAB #100470

Client:	National Guard Bureau	**Job Name:**	Glen Arm RC	**Chain Of Custody:**	516025		
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	**Job Location:**	Glen Arm, MD	**Date Submitted:**	6/4/2013		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	6/11/2013	**Report Date:**	6/11/2013
Attention:	[redacted]						

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft^2)	Reporting Limit		Total ug	Final Result		Comments
13067151	1	Flame	Air	450	N/A	6.7	ug/m³	<3	<6.7	ug/m³	
13067152	2	Flame	Air	450	N/A	6.7	ug/m³	<3	<6.7	ug/m³	
13067153	3	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067154	4	Flame	Wipe	****	0.108	110	ug/ft²	15	140	ug/ft²	
13067155	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067156	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067157	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067158	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067159	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067160	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067161	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13067162	12	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13067163	13	Flame	Air Blank	0	N/A	3	ug/m³		<3	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.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY
LAB #100470

Client:	National Guard Bureau	**Job Name:**	Glen Arm RC	**Chain Of Custody:**	516025		
Address:	301-IH Old Bay Lane, Attn: ARNG-CIG-P, State Military Reservation	**Job Location:**	Glen Arm, MD	**Date Submitted:**	6/4/2013		
	Havre de Grace, Maryland 21078	**Job Number:**	Not Provided	**Person Submitting:**	[redacted]		
		P.O. Number:	W912K6-09-A-0003	**Date Analyzed:**	6/11/2013	**Report Date:**	6/11/2013
Attention:	[redacted]						

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B
Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B
N/A = Not Applicable   mg/Kg = parts per million (ppm) on a dry weight basis   mg/L = parts per million (ppm)
%Pb = percent lead on a dry weight basis   ug = micrograms   ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these samples.

Analyst: S. Chinnapad / K. Shipe

Technical Manager: G Edward Carney

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Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 516025

page 1 of 2

Mailing/Billing Information:
1. Client Name: National Guard Bureau
2. Address 1: 301-IH Old Bay Lane
3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Glen Arm RC
2. Job location: Glen Arm - MD
3. Job #: ________ P.O. #: W912K6-09-A-0003
4. Contact Person [redacted] @ phone #: (410) 942-0273
5. Submitted by: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due: ________
☐ 24 Hours Time Due: ________
Comments: ________

NORMAL BUSINESS HOURS
~~☒ Immediate~~
☐ Next Day
☐ 2 Day
☐ 3 Day
☒ 5 Day + Date Due: 6/11/13
☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ Email: [redacted] @us.army.mil
☐ Fax: [redacted] @us.army.mil
☐ Verbal: [redacted]

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ________ (QTY)
☐ Fiberglass ________ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ________ (QTY)
☐ NIOSH 7402 ________ (QTY)
☐ Other (specify ________) ________ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ________ (QTY)
☐ EPA Point Count ________ (QTY)
☐ NY State Friable 198.1 ________ (QTY)
☐ Grav. Reduction ELAP 198.6 ________ (QTY)
☐ Other (specify ________) ________ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM __ (Qual) PLM __ (Quan) PLM/TEM __ (Qual) PLM/TEM __ (Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ________ (QTY)
☐ NY State PLM/TEM ________ (QTY)
☐ Residual Ash ________ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ________ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ________ (QTY)
☐ Quan. (s/area)Dust D6480-99 ________ (QTY)
TEM Water
☐ Qual. (pres/abs) ________ (QTY)
☐ ELAP 198.2/EPA 100.2 ________ (QTY)
☐ EPA 100.1 ________ (QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples ______ °C)

Metal Analysis
☐ Pb Paint Chip ________ (QTY)
☒ Pb Dust Wipe (wipe type Ghost) 10 (QTY)
☒ Pb Air 3 (QTY)
☐ Pb Soil/Solid ________ (QTY)
☐ Pb TCLP ________ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ________) ________ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ________
Collection Media ________
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHERS	SPORE TRAP	TAPE	SWAB
1. Drill Hall		5-31	450					X		X						
2. Classroom	117		450					X		X						
3 Drill Hall	floor			100 cm²				X				X				
4 Drill Hall	coke machine							X				X				
5 Drill Hall - elliptical								X				X				
6 kitchen - microwave								X				X				
7 kitchen - counter top								X				X				
8 Hallway - left - floor								X				X				
9 Foyer - top of computer								X				X				
10 Copy room - desk								X				X				
11 Classroom	117-A - table							X				X				
12 Blank - wipe																

CLIENT CONTACT
(LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 6 / 4 / 13 @ 1000 Via: Fedex By (Print): MAM Sign: ________
2. Date/Time Analyzed: ____ / ____ / ____ @ ____ By (Print): ________ Sign: ________
3. Results Reported To: ________ Via: ________ Date: ____ / ____ / ____ Time: ________ Initials: ________
4. Comments: 1995 0135 6187

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CHAIN OF CUSTODY

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page 2 of 2

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3. Address 2: Attn: NGB-ARS-IHNE
4. Address 3: Havre de Grace, Maryland 21078
5. Phone #: (410) 942-0273 Fax #: (410) 942-0254

Submittal Information:
1. Job Name: Glen Arm - RC
2. Job Location: Glen Arm - MD
3. Job #: P.O. #: W912K6-09-A-0003
4. Contact Person [redacted] @ phone # (410) 942-0273
5. Submitted by: [redacted] Signature: [redacted]

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due: ____
☐ 24 Hours Time Due: ____
Comments: ____

NORMAL BUSINESS HOURS
☒ Immediate ☐ 3 Day ☐ Results Required By Noon (Every Attempt Will Be Made to Accomodate)
☐ Next Day ☐ 5 Day +
☐ 2 Day Date Due: ____

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ Email: [redacted] @ Compliance-plans.c...
☐ Fax: @us.army.mil
☐ Verbal @us.army.mil

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 ____ (QTY)
☐ Fiberglass ____ (QTY)
TEM Air – Please Indicate Filter Type:
☐ AHERA ____ (QTY)
☐ NIOSH 7402 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate ____ (QTY)
☐ EPA Point Count ____ (QTY)
☐ NY State Friable 198.1 ____ (QTY)
☐ Grav. Reduction ELAP 198.6 ____ (QTY)
☐ Other (specify ____) ____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM __(Qual) PLM __(Quan) PLM/TEM __(Qual) PLM/TEM __(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield ____ (QTY)
☐ NY State PLM/TEM ____ (QTY)
☐ Residual Ash ____ (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust ____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 ____ (QTY)
☐ Quan. (s/area) Dust D6480-99 ____ (QTY)
TEM Water
☐ Qual. (pres/abs) ____ (QTY)
☐ ELAP 198.2/EPA 100.2 ____ (QTY)
☐ EPA 100.1 ____ (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ____ °C)

Metals Analysis
☐ Pb Paint Chip ____ (QTY)
☐ Pb Dust Wipe (wipe type ____) ____ (QTY)
☐ Pb Air ____ (QTY)
☐ Pb Soil/Solid ____ (QTY)
☐ Pb TCLP ____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media ____) ____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: ____
Collection Media ____
☐ Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION / **ANALYSIS** / **METHODS**

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
13 - Blank -	Air	5-31	0					X		X						

CLIENT CONTACT (LABORATORY STAFF ONLY)

Date/Time:	Contact:	By:
Date/Time:	Contact:	By:
Date/Time:	Contact:	By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: ___/___/___ @ ___ Via: ___ By (Print): ___ Sign: ___
2. Date/Time Analyzed: ___/___/___ @ ___ By (Print): ___ Sign: ___
3. Results Reported To: ___ Via: ___ Date: ___/___/___ Time: ___ Initials: ___
4. Comments: ___

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Appendix B. Photographs

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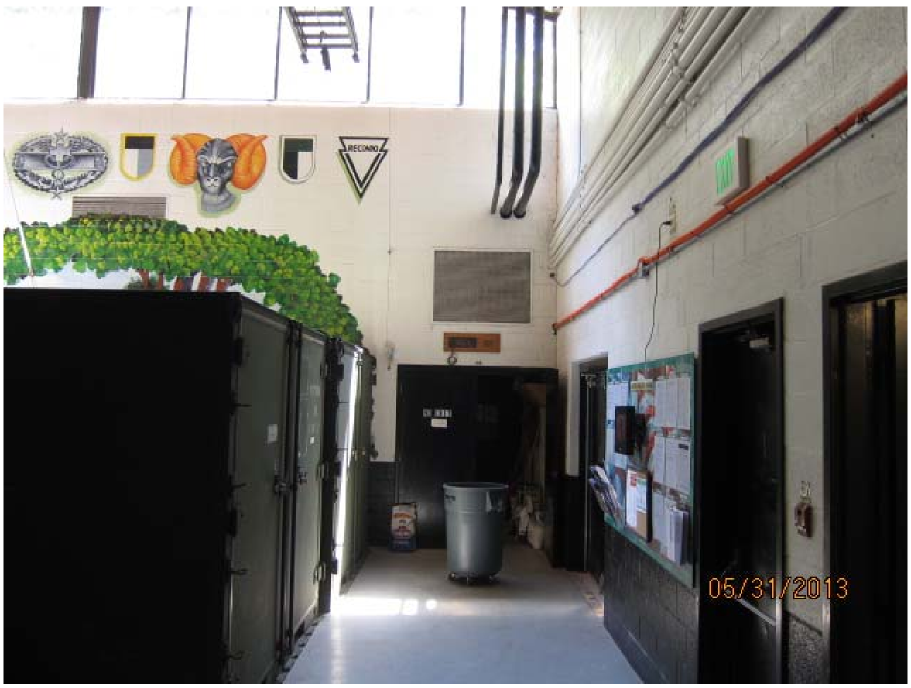
Drill Hall



Drill Hall leaking pipe garbage can collecting water

Water stained and damaged ceiling tiles in the foyer

Exterior of facility

Appendix C. Floor Plan

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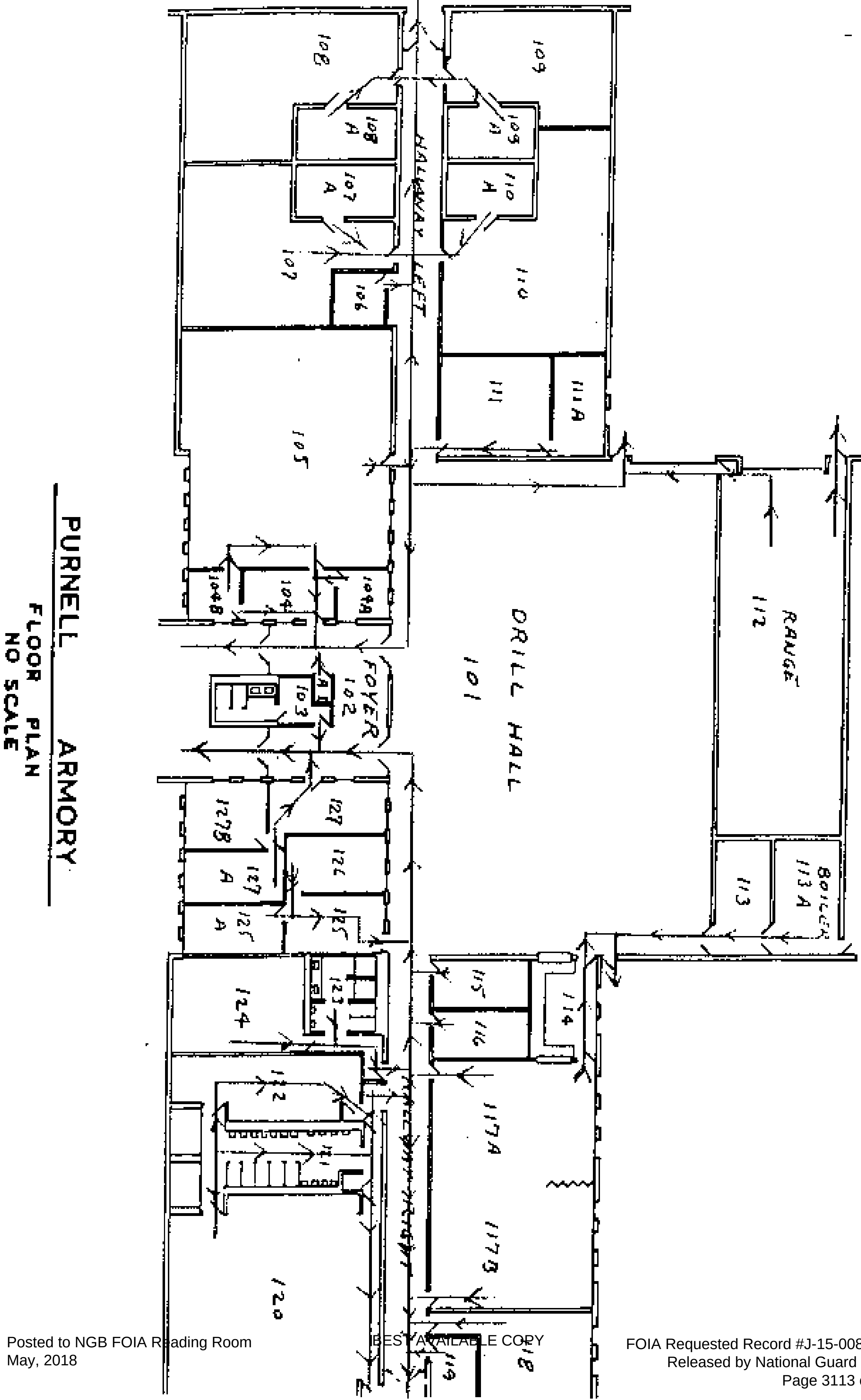

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Appendix D. References

1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead.

2. American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2011 Edition.

3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition.

4. American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2010.

5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.

6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.

7. National Emission Standard Hazardous Air Pollutants (NESHAP) – The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

8. National Ambient Air Quality Standards (NAAQS) - National primary ambient air quality standards for carbon monoxide 40 CFR 50.8.

9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h) (3)].

10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM).

11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.

12. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.

13. ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.

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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. [redacted]), 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. [redacted], at commercial (410) 436-5475/3118, DSN 584-5475/3118 or electronic mail:[redacted]@us.army.mil

FOR THE COMMANDER:

[redacted]

Encl

Director, Occupational Health Sciences

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U.S. Army Center for Health Promotion and Preventive Medicine

USACHPPM

CONSERVARE SALUTEM

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

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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
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. Lead Exposure. 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. Asbestos. 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. Lead Exposure. 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. Safety. 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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MDARNG Facilities, IH Baseline Survey, First Regiment Armory, Glen Burnie, MD Report No. 55-ML-01ED-03/06

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APPENDICES

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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. [redacted]), 28 February 2003, subject: SAB.

4. BACKGROUND INFORMATION.

a. Armory Background Information. The Armory resident unit is the First Regiment. The approximate date of construction was 1940.

b. Armory Use by Children. 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. Point of contact (POC). The POC was the manager, SFC [redacted], 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

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may have been asbestos-containing building material (ACBM). The MDARNG State Occupational Health Nurse, LTC [redacted], was notified. LTC [redacted] 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 ($\mu g/m^3$) of air.

b. <u>Lead in Dust</u>.

(1) The Environmental Protection Agency (EPA) and State of Maryland limits for lead in dust are 40 $\mu g/ft^2$ 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.

(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.

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(3) The NGB Region North concurs with the USACHPPM recommended safe limit of 200 $\mu g/ft^2$ on floors and surfaces frequently contacted by facility employees, 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 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. Lead Carcinogenicity. The Department of Health and Human Services National Toxicology Program (NTP) released the Report on Carcinogens, Eleventh Edition in February 2005. The NTP report lists "lead and lead compounds" as "reasonably anticipated to be human carcinogens."

7. SAMPLING RESULTS, DISCUSSION, AND CONCLUSIONS.

a. Lead in Dust. Lead in dust sample locations and analytical results are shown in the Table 1. Sample results greater than 40 $\mu g/ft^2$ for floors or 200 $\mu g/ft^2$ for other surfaces are highlighted. High levels of lead were found on the Conference Room file cabinet (486 $\mu g/ft^2$) and the Conference Room window sill (527 $\mu g/ft^2$).

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Table 1
Lead in Surface Dust

Wipe Sample Number	Location of Samples	Result ($\mu g/ft^2$)
GBW01	Gym Floor	<23
GBW02	Gym Floor	<23
GBW03	Gym Floor	<23
GBW04	Gym Floor	<23
GBW05	Gym Floor	<23
GBW06	Conference Room/Top of File Cabinet	[redacted]
GBW07	Conference Room Desk	<23
GBW08	Conference Room Desk	23
GBW09	Conference Room/Window Sill	[redacted]
GBW10	Drill Room Floor	<23
GBW11	Drill Room Floor/Next to Garage Entrance	[redacted]
GBW12	NCO Club	<23
GBW13	Hallway	<23
GBW14	Second Floor Locker Top	<23
GBW15	Second Floor Latrine	<23
GBW16	Second Floor Hallway	<23
GBW17	Conference Room Floor	[redacted]
GBW18	Drill Floor	<23

Table 2
Lead in Paint

Wipe Sample Number	Location of Samples	Result (%)
GB Bulk-1	Conference Room/Wall 1	0.324
GB Bulk-2	Conference Room/Wall 2	0.696
GB Bulk-3	Hallway	0.348

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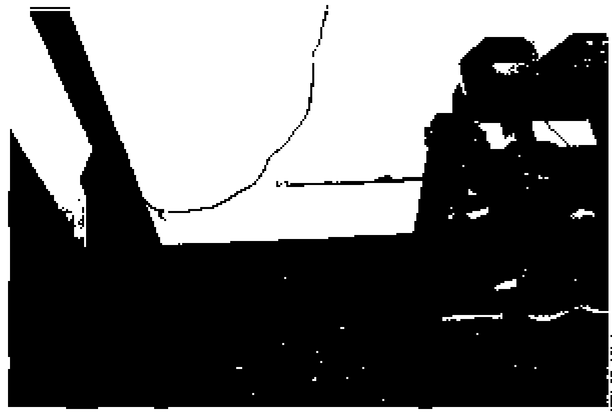
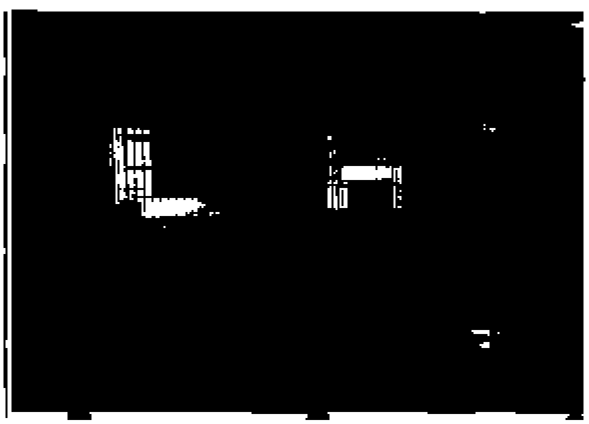
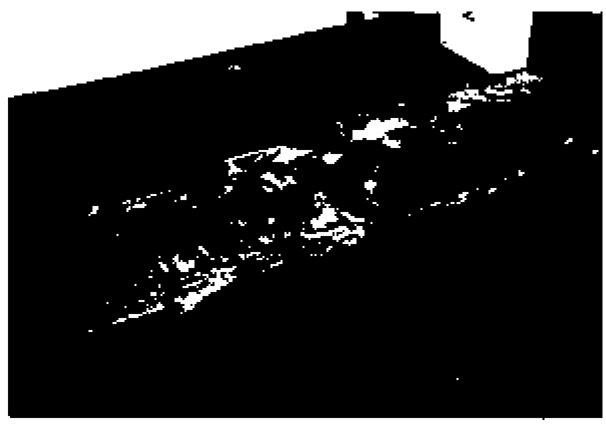
Photograph 1. Converted IFR/Classroom



Photograph 2. Converted IFR/Gym



Photograph 3. Converted IFR/Gym



Photograph 4. Conference Room, Asbestos Floor Tiles

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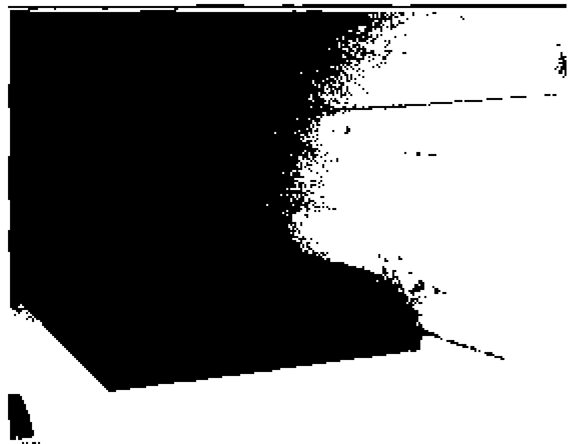
Photograph 5. Drill Hall



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 $\mu g/ft^2$ on floors and 250 $\mu g/ft^2$ on window sills. These levels are hazardous to children exposed to lead dust through physical contact, inhalation, or ingestion while visiting the Armory.

b. Lead in Paint. 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. Asbestos. 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. Lead Exposure. 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. Safety. 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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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: [redacted]us.army.mil

[redacted]
Industrial Hygienist
USACHPPM Lead and Asbestos Team Leader
Industrial Hygiene Field Services Program

APPROVED:

[redacted]
Administrative Program Manager
Industrial Hygiene Field Services Program

APPENDIX A

REFERENCES

1. Title 29, Code of Federal Regulations (CFR), Parts 1910 and 1962, 2005 rev. http://www.osha.gov/comp-links.html

2. 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

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6. American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs), ACGIH, Cincinnati, OH, 2005. http://www.acgih.org/TLV/

7. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 62-2002, Ventilation for Acceptable Indoor Air Quality, 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 (HUD), Technical Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, 1998. http://www.hud.gov/offices/lead/guidelines/hudguidelines/index.cfm

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APPENDIX B

SUBJECT: National Guard Bureau Region North Industrial Hygiene Office
Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 μg/ft². This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. The EPA standards (40 CFR 745.227(e) (8) (viii)) and State of Maryland standards are not directly applicable because they are developed for floors (40 μg/ft²), windowsills (250 μg/ft²) and window troughs (400 μg/ft²) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. The OSHA has no specific requirement for work area surfaces. The OSHA lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. The OSHA cites a level of 200 μg/ft² in OSHA Instruction CPL 2-2.58 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 μg/ft² is a safe surface contamination level for adult exposures. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels higher than those recommended above do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All States will receive this guidance when it is completed.

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 50 μg/m³ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

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APPENDIX C

SAMPLING SHEETS AND LAB ANALYSES

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Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211
(303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

August 8, 2003

Laboratory Code:	**RES**
Subcontract Number:	**NA**
Laboratory Report:	**RES 95872-1**
Project Description:	**None given**
	None given

[redacted]
USACHPPM
USACHPM, ATTN: MCHB-TS-OFS Bldg 1570
APG MD 21010

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association, Lab ID 101533 - Accreditation Certificate #480. The laboratory is currently proficient in both PAT & ELPAT programs respectively.

Reservoirs has analyzed the following sample(s) using Atomic Emission Spectroscopy - Inductively Coupled Plasma (AES-ICP) per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the analysis table. Results have been sent to your office.

RES 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,

[redacted]

President

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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 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 6, 2003**

Client ID Number	Lab ID Number	Detection Limit (%)	LEAD CONCENTRATION (%)
GB Bulk-1	EM 798809	0.005	0.324
GB Bulk-2	EM 798810	0.005	0.696
GB Bulk-3	EM 798811	0.005	0.348

BDL = Below Detection Limit

Data Qa

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Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211
(303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

REMIT TO: 2059 Bryant St. Denver, CO 80211

Invoice to:

[redacted]
MD National Guard Bureau
301-IH Old Bay Lane
Havre De Grace MD 21078

Invoice Date: August 8, 2003
Invoice Number: 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
	RES Job #:	95872-1				
	Desc:	None given				
	Submitted By:	MD National Guard Bureau				
	P/O No:	None given				
	Contact:	[redacted]				
25	AA/ICP Metal	Wipe	3-5 Day	4125-02	$7.50	$187.50

Invoice Total: $187.50

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RESERVOIRS ENVIRONMENTAL, INC.

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RESI Job #. 45832

Due Date: 7-20-3-1
Due Time: 10:15

SAMPLES SUBMITTED BY:

Company: USACHPPM

Contact:

Project Description and/or P.O. #:

SAMPLES:

No.	Client Sample Number	Volume	EM #
1	ABW-12		02
2	-13		03
3	-15		04
4	ABW BLANK 1		05
5	ABW-16		06
6	-12		07
7	-15		08
8			
9	GB BLK-1		09
10	-2		10
11	-3		11
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APPENDIX D

CLEANING GUIDELINES FOR LEAD

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CHAPTER 14: CLEANING

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Cleaning: How To Do It

1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.

2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.

3. Have sufficient cleaning equipment and supplies *before* beginning work.

4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.

5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.

6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.

7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.

8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.

9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.

10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.

11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.

12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.

13. Paint or otherwise seal treated surfaces and interior floors.

14. Conduct a clearance examination (see Chapter 15).

15. If clearance is not achieved, repeat the final cleaning.

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Step-by-Step Summary (continued)

16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.

17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.

18. Cleaning equipment list:

- HEPA vacuums.
- Detergent.
- Waterproof gloves.
- Rags.
- Sponges.
- Mops.
- Buckets.
- HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
- 6-mil plastic bags.
- Debris containers.
- Waste water containers.
- Shovels.
- Rakes.
- Water-misting sprayers.
- 6-mil polyethylene sheeting (or equivalent).

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Chapter 14: Cleaning

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris and dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 $\mu g/ft^2$ on floors.
- 500 $\mu g/ft^2$ on interior window sills (stools).
- 800 $\mu g/ft^2$ on window troughs (the area where the sash sits when closed).
- 800 $\mu g/ft^2$ on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

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2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

✓ Is the critical importance of cleaning in a hazard control project understood?

✓ Have all workers been trained and certified for hazard control work?

✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?

✓ Have cleaning equipment and materials been obtained?

✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?

✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?

✓ Are all workers properly protected during the cleaning processes (see Chapter 9)?

✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?

✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?

✓ Are the clearance criteria to be met fully understood?

✓ Have all appropriate surfaces been properly painted or otherwise sealed?

✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).

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C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that fine-dust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.

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Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards and were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.

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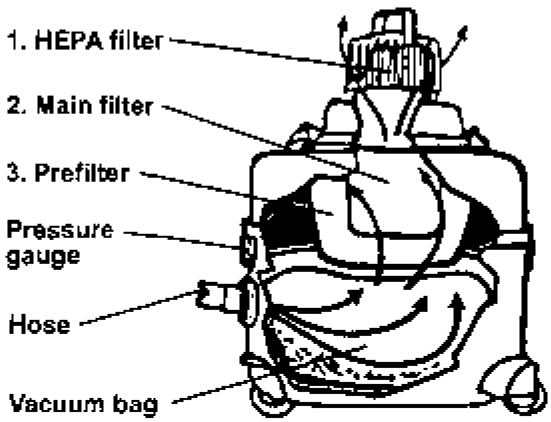
Figure 14.1a Vacuum With a HEPA Filter.



Parts of a HEPA-vacuum
Most HEPA-vacuums have three filters: HEPA filter, main filter, and pre-filter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the pre-filter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a high-phosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

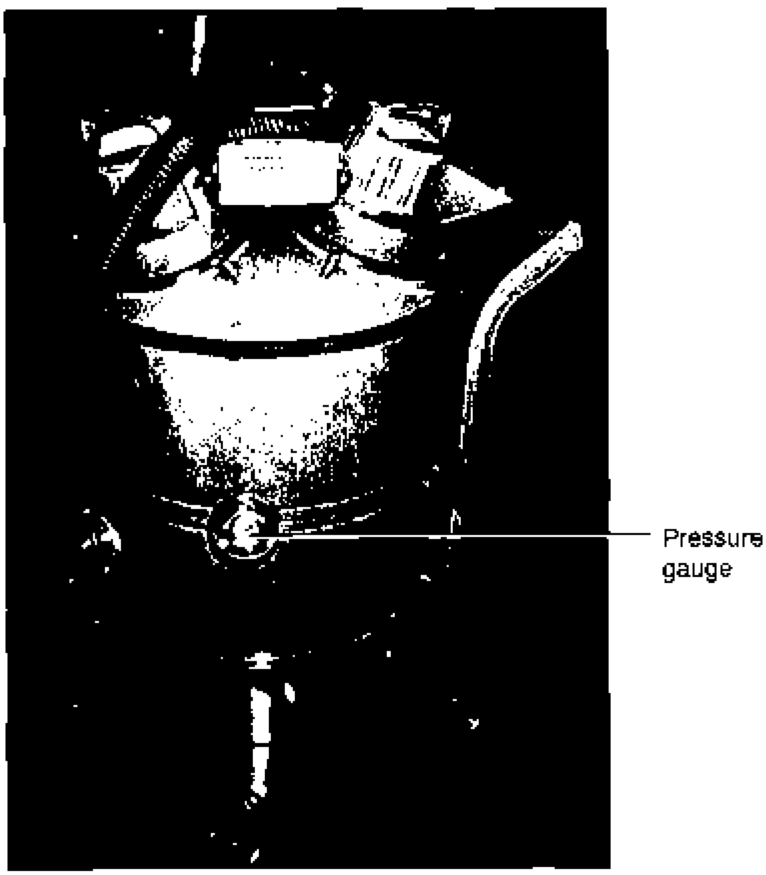


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.

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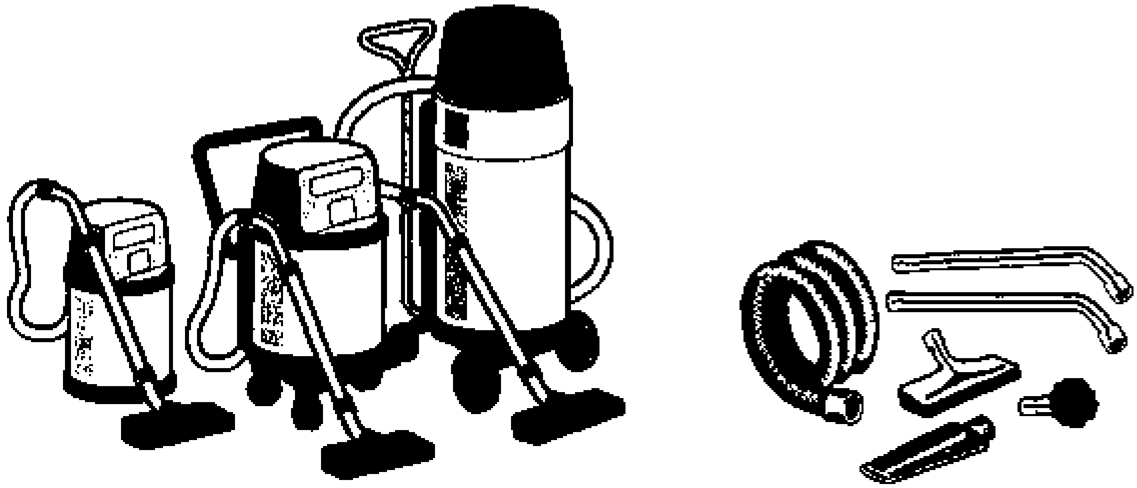
Figure 14.2 HEPA Vacuum Sizes and Tools.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wet-wash process.

Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no

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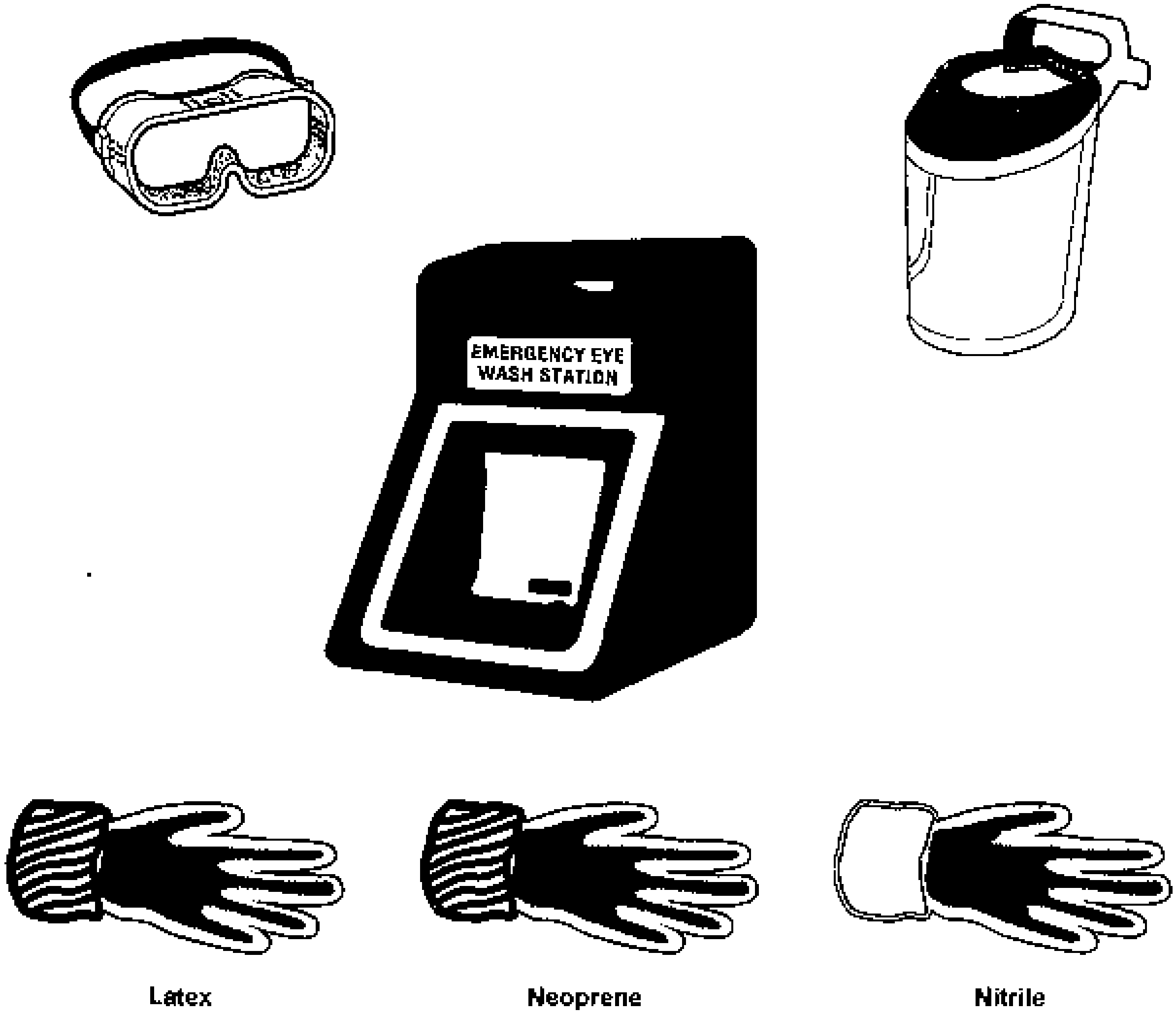
Figure 14.3 Goggles, Face Shields, Gloves, and Eye Wash Facilities Should Be Available When Used With Chemicals Such as TSP.



more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

- First, the area is HEPA vacuumed.

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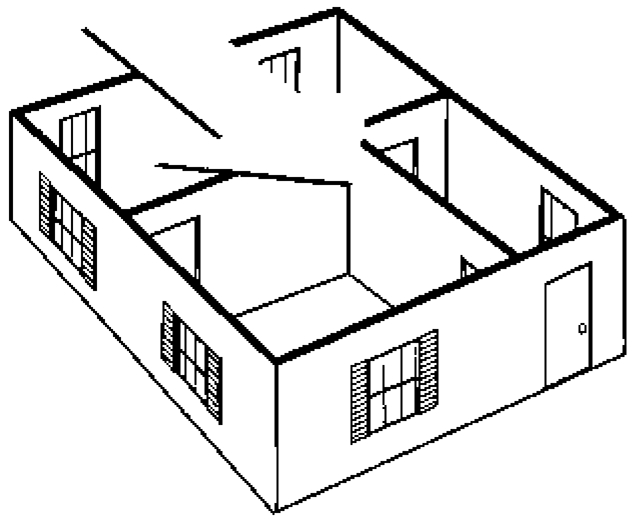
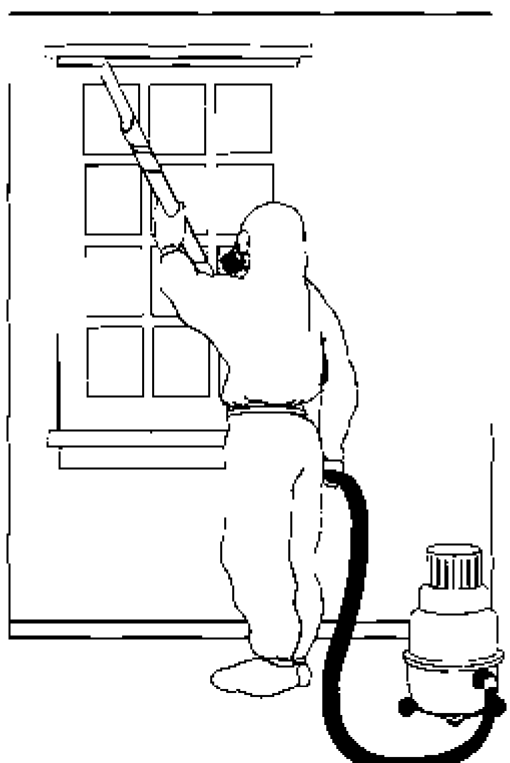
Figure 14.4a The HEPA Vacuum, Wet Wash, HEPA Vacuum Cycle Helps in Meeting Clearance Standards.

HEPA vacuum all surfaces
Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there.



Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on, and work down to the floor. Do every inch of the windows, especially the window troughs.



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- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.

Figure 14.4b (continued)

Use special attachments
Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork.

Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Move slowly
Vacuum slowly so the HEPA vacuum can pick up all the lead dust.

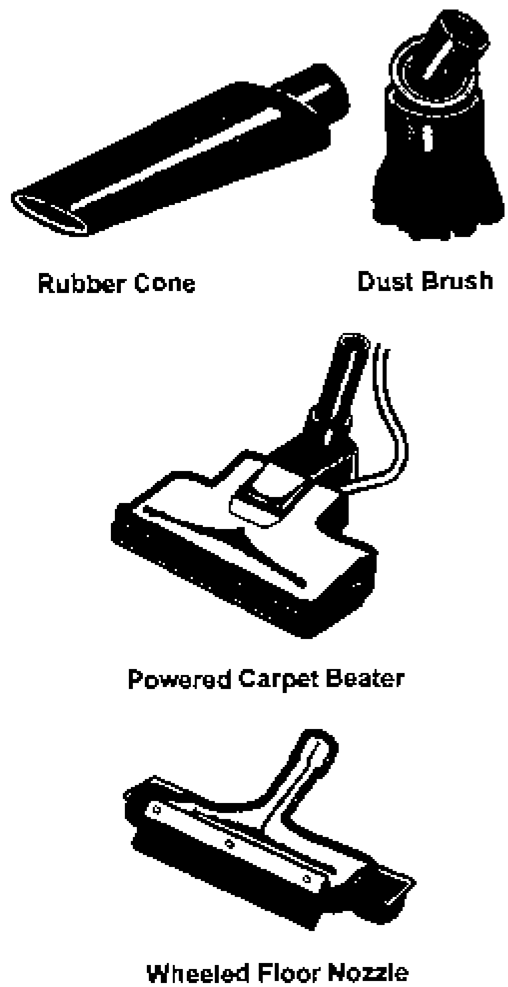

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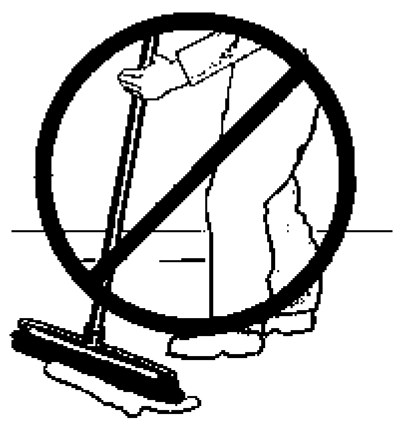
Figure 14.4c (continued)

Wash all surfaces with suitable detergents

Wash *all surfaces* in the work area with suitable detergents, including areas that had been covered with plastic. Some wallpaper should only be HEPA vacuumed, since it may be damaged by the detergent.

Wipe All Surfaces

Wet Mop Floor



Don't Dry Sweep

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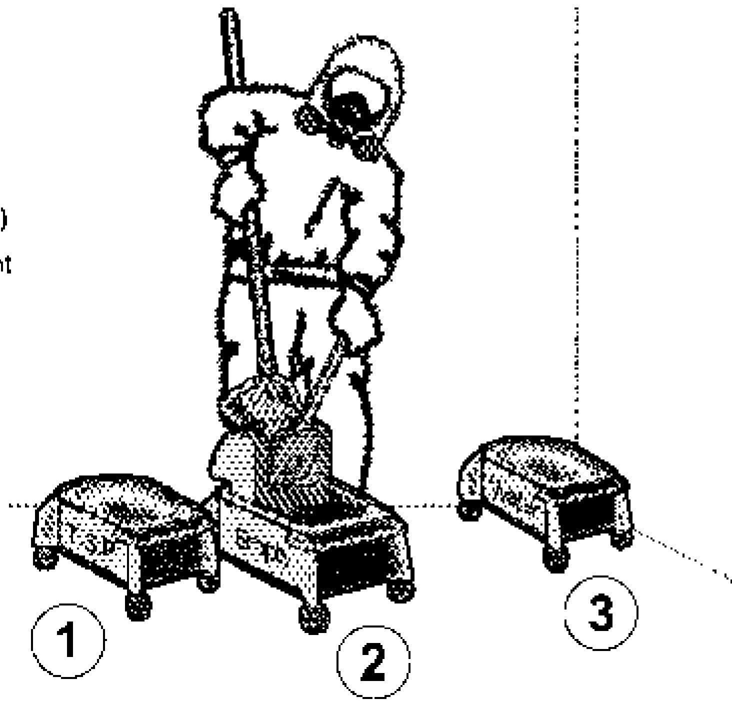
Figure 14.4c (continued)

Use the 3-Bucket System.

To wash: Use string mops and mop buckets with wringers. (Some experts say **NEVER** use a sponge mop on the floor. Sponge mops may only push the lead around on the floor, not remove it.)

Dip the string mophead in the detergent wash in bucket #1. Mop the floor.



Squeeze out the mophead in empty bucket #2. Return to bucket #1 for more detergent solution and continue mopping. Repeat.

Use the third bucket for rinsing the floor.

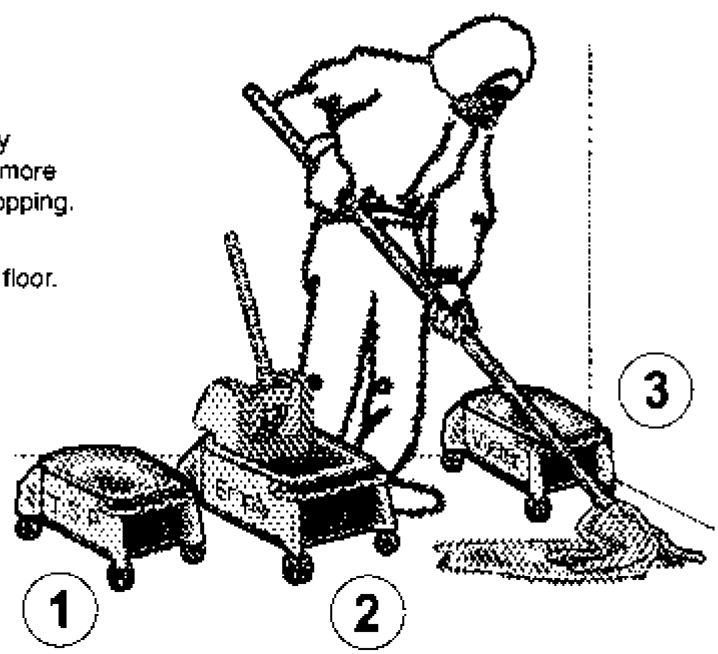


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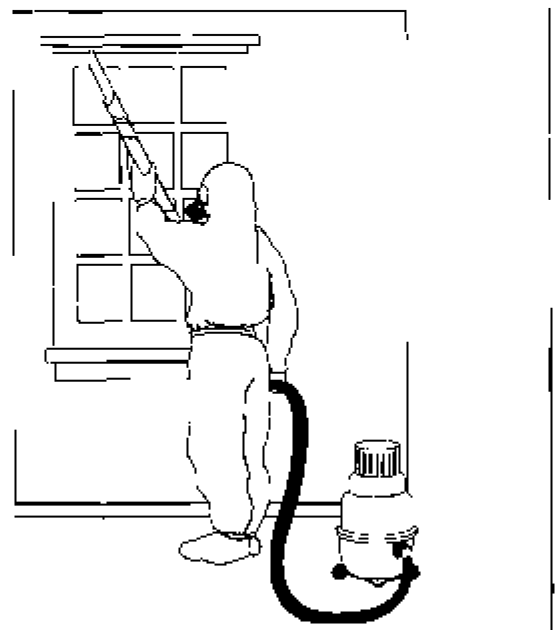
Figure 14.4d (continued)

HEPA vacuum all surfaces a final time
HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the

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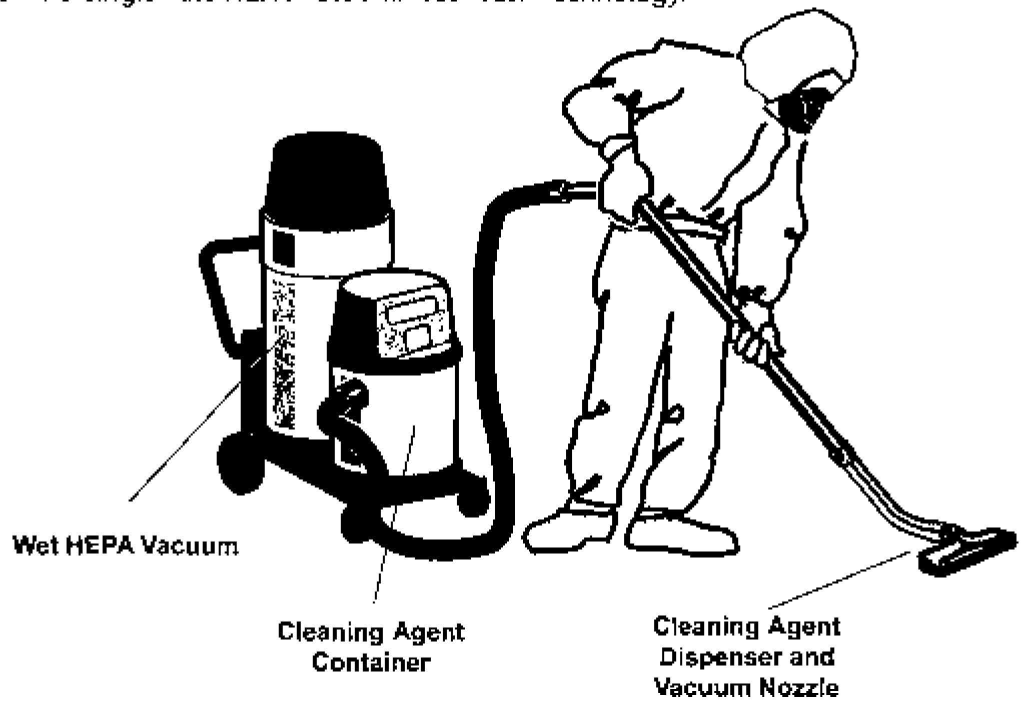
Figure 14.5 Single-Pass HEPA Vacuum/Wet Wash Technology.



Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

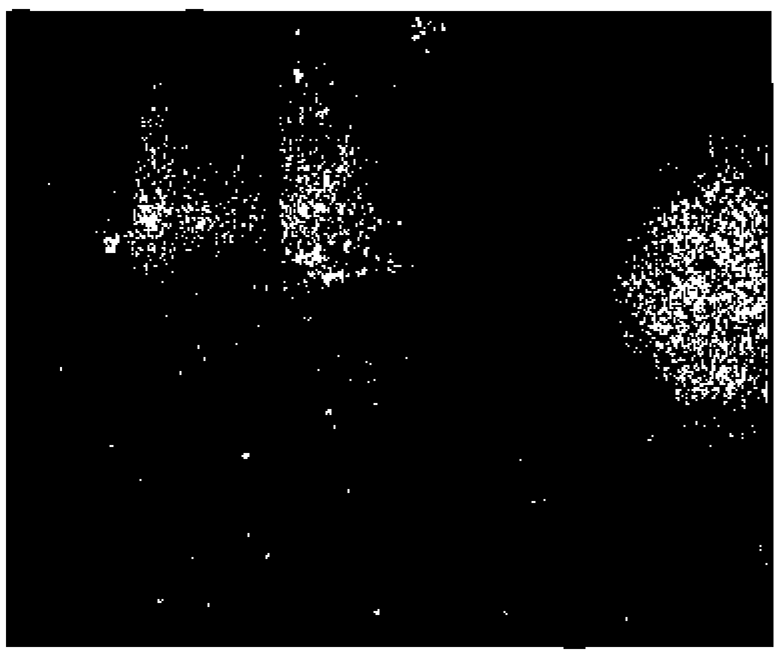


Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

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belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- Securing debris/plastic.

Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

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containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water and cleaned. All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plastic-removal process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).

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Figure 14.8a Pick Up Corners of Plastic Sheeting.

Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

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the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).

Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This

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option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dust-retaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

Table 14.1 Initial Cleaning Wipe-Test Failure Rates for Various Abatement Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	46.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)

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and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993).

These *Guidelines* do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Cycle Number	Mass Removal Efficiency Percentages — Cleaning Method			
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.8	67.0	29.4
5	59.3	88.9	72.1	32.5
6	61.6	91.2	74.4	34.9
7	63.8	93.1	76.4	36.5
8	67.5	95.4	77.5	38.1
9	67.5	97.7	78.7	40.1
10	67.2	100.0	80.2	41.7
11		102.3	80.2	41.7
12		104.6	84.1	44.8
13		104.6	84.5	46.8
14		103.8	84.5	48.4
15				49.6
16				50.8
17				52.4
18				53.6
19				54.4
20				55.2

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) *Effectiveness of Clean-up Techniques for Leaded Paint Dust*

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APPENDIX E

SITE MAPS

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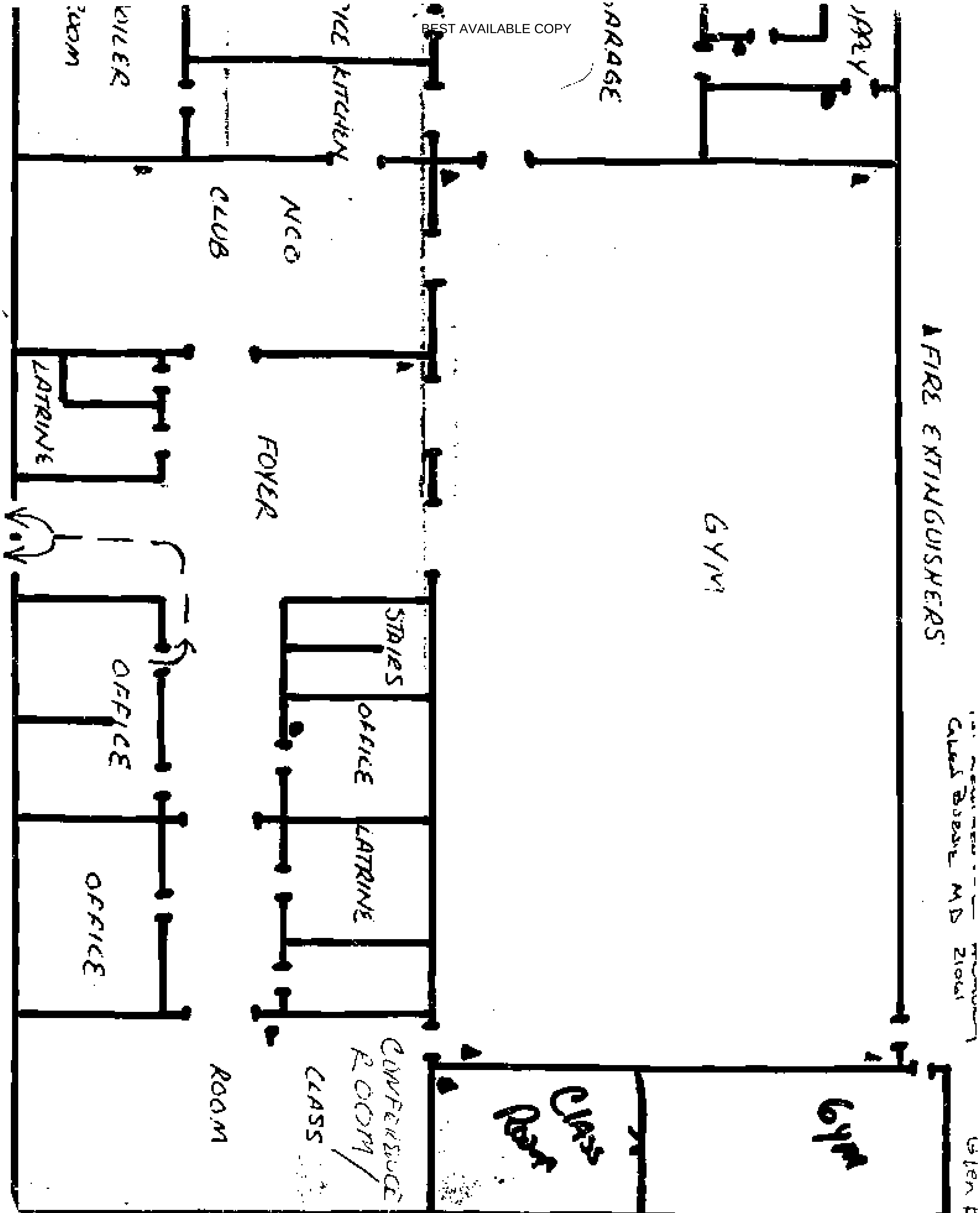

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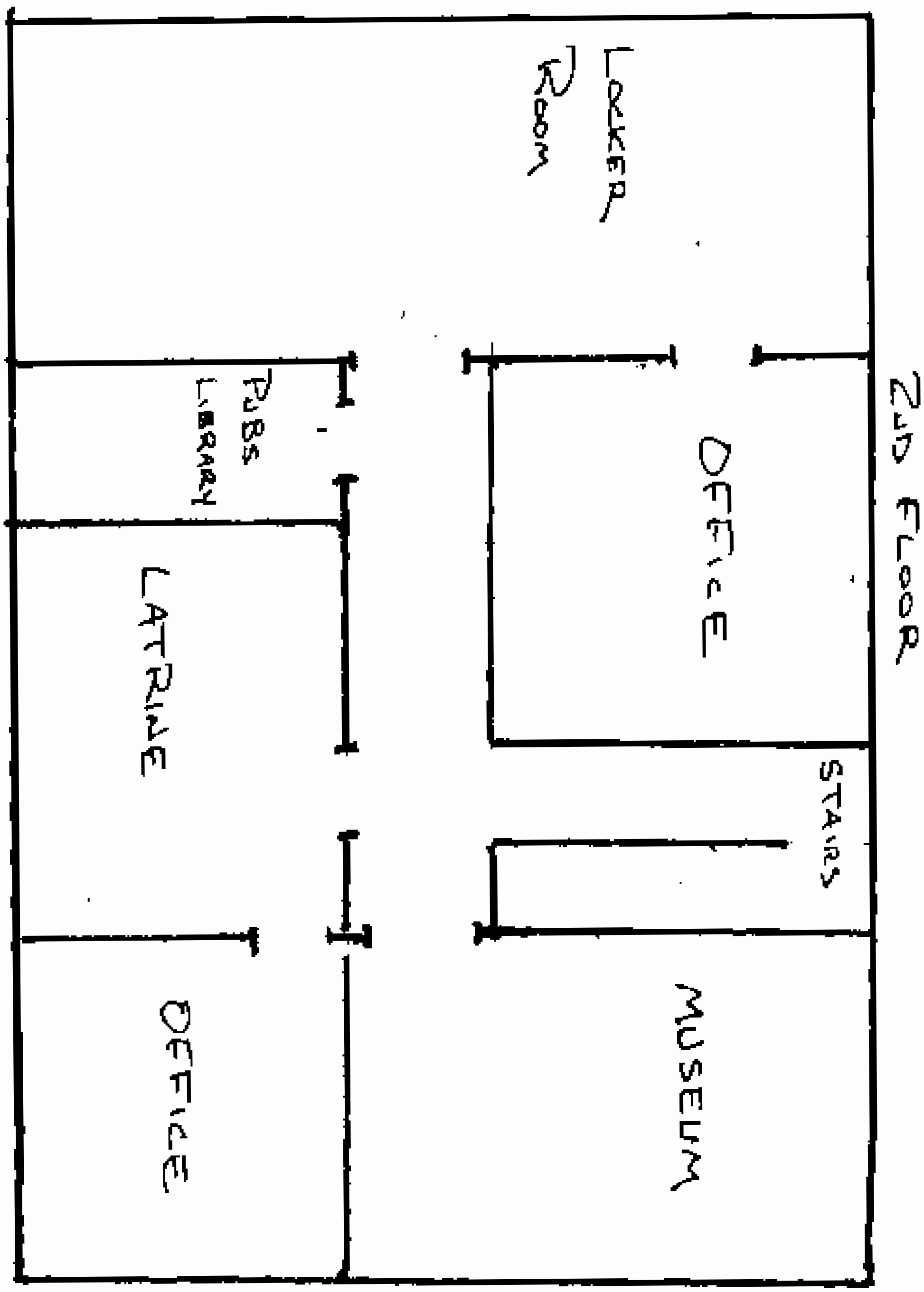

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National Guard Region North

National Guard Readiness Center
Industrial Hygiene Evaluation
Glen Burnie Army National Guard Armory
Glen Burnie, MD 21061-3203

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Project No. 1061-03
July 13, 2010

Bonus Environmental, LLC

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